Vol. II OCTOBER, 1916 No. 10

The INTERNATIONAL JOURNAL OF ORTHODONTIA

A Monthly Journal Devoted to the Advancement of the Science of Orthodontia

MARTIN DEWEY, D.D.S., M.D., Kansas City, Mo.
Editor-in-Chief

H. C. POLLOCK, D.D.S., St. Louis, Mo.
Associate Editor

JAMES DAVID McCOY, D.D.S., Los Angeles, Calif.
Editor, Department of Dental and Oral Radiography

PUBLISHED BY
THE C. V. MOSBY COMPANY
SAINT LOUIS

$3.00 Per Annum Single Copies, 30 Cents

The International Journal of Orthodontia

Editor: Martin Dewey, D.D.S., M.D.

VOL. II ST. LOUIS, OCTOBER, 1916 NO. 10

ORIGINAL ARTICLES

THE LINGUAL ARCH IN COMBINATION WITH THE LABIAL ARCH WITH EXTENSIONS AS USED BY DR. LLOYD S. LOURIE

BY MARTIN DEWEY, D.D.S., M.D., KANSAS CITY, MO.

Professor of Dental Anatomy and Orthodontia, Kansas City Dental College; President of The Dewey School of Orthodontia.

ARCHES or alignment wires are known to the orthodontic profession either as labial or lingual arches. Orthodontists are familiar with the ordinary labial arch, also known as the expansion arch, which consists of a piece of metal threaded at both ends. However, the lingual arch was introduced later and is manufactured in various types. The lingual arch which I will attempt to describe in this paper as used by Dr. Lloyd S. Lourie, of Chicago, is worthy of special attention because of its compactness and esthetic value. This lingual arch has been evolved from the old retaining appliance, which consisted of bands upon the canines with a wire lingual to the incisors soldered to the canine bands.

This form of lingual retaining device was described by Angle in the sixth edition of his book on "Malocclusion of the Teeth." When this form of retaining device was used, rubber plates were employed for the retention of the molars and premolars. Some time before 1905 Lourie began using a lingual arch, the ends of which extended back to the bands on the molars. This lingual arch was made from a piece of wire which had been made to fit the lingual surfaces of the teeth, by soldering tubes on the distal end to slip over the screws of the ordinary molar clamp band on the "D" band as described by Angle. This was used for the retention of cases when it was found necessary to discontinue treatment during the summer vacation period.

It was found by using the wire stretchers and by making bends in the lingual arch that a certain amount of tooth movement could be accomplished without readjusting the ordinary expansion arch, which could be very easily adjusted because the clasp bands would still be in position with the buccal tubes. Lourie

used this form of the lingual arch as a retaining device for several years before he demonstrated it at a clinic at the Chicago meeting of the American Society of Orthodontists in 1905.

While using the lingual arch as a retaining appliance and being able to accomplish certain movements by using the wire stretchers and by bending the lingual arch, it appealed to him very much as a possible regulating device. He also found that such teeth as required rotation could be rotated as satisfactorily by using ligatures and bands in conjunction with the lingual arch as when the labial arch was used. By the use of either the labial or lingual arch alone with bands and ligatures, root movement can be controlled. He therefore began the use of the labial arch with the extensions which made possible root movement with the use of the bands, and consequently gave us a labial appliance which was less conspicuous than anything we have had heretofore. Owing to the fact that the labial arch has always been conspicuous, it is recommended in those cases where the lingual arch alone can be used because of its inconspicuousness and its esthetic advantages. This is sufficient to recommend its use in all possible cases. In fact, after seeing a number of Lourie's patients and examining a large number of models of cases which he has treated by using the lingual arch, I am of the opinion that the possibilities of the lingual arch with the small labial arch are limited only by the skill and ability of the operator. Another advantage of the lingual arch as compared with the ordinary expansion arch is that the appliance necessarily is shorter and can be made of smaller gauge without danger of displacement due to springing and bending. The shorter the distance between the point of the anchorage and the moving of the malposed tooth, the smaller the appliance can be in diameter. There is a limit to the small gauge and size of the labial arch especially if there is a great distance between the points of attachment. The small-gauged labial arch can be used if it is attached between the anchorage and the moving teeth. It must be remembered, however, that if there are many points of attachment and if those points are made rigid by the use of a large number of bands with some locking device, they necessarily interfere with the movement of the teeth by making a larger number of points of attachment which in turn will have some influence upon the anchor tooth, and also upon those teeth which are attached to the appliance. In using any style of the labial arch the greater the freedom of the movement or adjustment that you have upon the malposed tooth, the more satisfactory the appliance will be.

As stated before, there is a limit to the smallness of the gauge of the labial arch owing to the long span between the anchorage from the right to the left side, if the molar teeth are used as anchorage. If an attempt is made to move the incisors forward, the small-gauged labial arch, with attachments on the incisors and molars, will very often bend and spring towards the cheek and stand away from the teeth so as to cause an abrasion of the mucous membrane of the cheek. Of course this condition would not be allowed to exist very long with most operators, but I have seen it occur in a great many cases where the attempt was being made to use a small-gauged labial arch.

With a small-gauged lingual arch this bending is not apt to occur; in fact, it cannot occur because of the proximity between the lingual surfaces of the

incisors and the molars. It is possible to satisfactorily use material of a much smaller gauge for the lingual arch than for the labial arch for the same amount or type of tooth movement.

As stated before, the use of the lingual arch as employed by Lourie was evolved from the older retaining appliance which was first constructed by soldering tubes on the arch to fit the end of the screws on the molar clamp bands. The molar bands which carried buccal tubes were thus left in position and it was this buccal tube that was used with the labial arch with extensions. It was found by stretching and bending the lingual arch that a large amount of tooth movement could be accomplished and that rotation could be obtained in certain types by the use of the band and spurs.

The lingual arch in itself was not satisfactory when root movement was desired, but having the buccal tubes on the molar bands a labial wire could be used for that purpose. Such a wire is shown in Fig. 1, which is a labial arch of 17 gauge, gold and platinum, to which has been soldered four extensions projecting occlusally on the labial surface of the tooth too near the cutting edge and

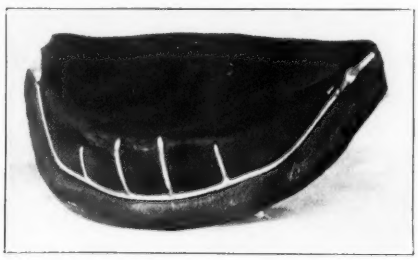


Fig. 1.

thereby controlling the apical tooth movement. This labial arch when used with these extensions is adjusted so as not to come in contact with the gingivus. In fact, it is placed so far gingivally that it lays above the gingival margin of the tooth under the lip. The labial spur extensions stand away from the gum, as does the labial arch, so as not to interfere with the gingival tissue, and then touches the tooth at some point near the cutting edge. If a greater amount of the apical tooth movement is desired the spur touches the tooth near the cutting edge or may be bent over slightly to engage the incisal edge of the tooth. The labial arch is held in position either by the use of the intermaxillary rubber or by a ligature tied distal to the tube on the upper molar and in front of the intermaxillary hooks. When these labial arches are adjusted the patient is often advised that the appliance can be removed during the daytime and need be worn only at night; however, the majority of patients wear them continuously since no part of the appliance is visible except the small labial extensions. The shape of the labial arch can be maintained during the day by being placed on a form made out of modeling compound, upon which the arch is shown in Fig. 1.

As above stated, the lingual arch was first used by Lourie with a tube on the end to slip over the threaded portion of the molar clamp band. Later in his practice after the molar clamp band was discarded, a plain molar band was used in retention.

The combination of the lingual and labial arch eliminates the use of bands

on the anterior teeth. The main objection to the use of these bands is that they cause separation between the teeth so that after they are removed there is a lack of proximal contact, and during this period the tooth very often returns to its rotated position. By using a combination of the labial and lingual arches it is possible to retain rotation of the anterior teeth without destroying the proximal contact.

Formerly the mistake was made in attempting to separate the treatment period from the retention period. Retention is really a part of the treatment and very often a retaining appliance must be so constructed as to make it possible to adjust the teeth finely and delicately so as to get the proper proximal contact as well as the occlusal relations. Cases which have been shown as finished results were not really such because the model had been made immediately after the appliance had been removed and before the retaining appliances had been adjusted. A finished result is one which can be shown after the period of retention has been completed and sufficient time has elapsed to prove that the forces of occlusion are going to hold the teeth in their proper position. The great advantage of the labial and lingual arches in combination is that they allow all of the forces of occlusion to act properly. This adjusts each individual tooth with the possible exception of the two teeth carrying the anchor bands. The anchor teeth carrying the bands which hold the labial and lingual arches have not the same freedom of movement as the remainder of the teeth, and it very often happens in distoclusion and sometimes in neutroclusion that during the period of treatment the bands are removed from the first molars (at the time the retaining appliance is adjusted) to the first premolars. This allows the molars an opportunity to respond to the forces of occlusion which they have been prevented from doing because of the wearing of the molar bands during the period of treatment.

As already mentioned, Lourie first employed the lingual arch as a retaining device, then began using it as a regulating appliance, and at the present time has evolved the use of the plain lingual arch to a very high degree of efficiency. Owing to its delicacy and inconspicuousness, this lingual arch certainly has a great future in orthodontia and especially to those of us who have some consideration for esthetics and our patient's comfort. I would therefore recommend to those who are interested in the lingual arch to begin using it first as a retaining appliance, and after they have accomplished the majority of tooth movements by using it in that manner, they will be able to obtain a degree of efficiency in bending and stretching the wire that will enable them to use it as a regulating appliance.

Very little has been said regarding the attachment of the lingual arch to the bands. It must be remembered that the lingual arch can be divided into several forms, those where it is soldered to the bands and those that have some form of removable attachment; however, it is not intended here to go into the various forms of attachment as the writer hopes to be able to give the details of these attachments later on. This article was prepared more to call attention to the apparent inconspicuousness and the high degree of efficiency of this appliance when it is properly manipulated, than to go into details of construction.

Up to the present time Lourie has principally used a labial arch of gold and

platinum of 17 gauge, as shown in Fig. 1. The 17 gauge arch of gold and platinum is used because it has sufficient strength to hold the arch in its proper position. As stated before the labial arch lies above the gingivus and consequently must be of sufficient strength so that it will not be displaced during the period of tooth movement or by the action of the lips. It is possible that an iridioplatinum arch of a smaller gauge than 17 could be used. With the 17 gauge gold and platinum arch placed above the gingivus with the extension spurs as shown in Fig. 1, the appliance is very inconspicuous and in a great many instances the labial arch is removable by the patient; still very few patients remove them because there is so little annoyance or embarrassment caused by the appearance of the arch. When the bands are placed on the premolars, a labial arch of 19 gauge can be used because of the shorter distance between the premolar anchorage, and there is no danger of the arch being displaced because of the short span between the anchorage.

If intermaxillary anchorage is employed while the bands are fixed on the first molars, and after having shifted to the first premolars, spurs are attached to the first premolar for attaching the intermaxillary hook to the premolar band instead of to the labial arch, it is possible to have the hook farther occlusally. This hook attached to the band is less conspicuous than if it were attached to the labial arch, as the latter always lies above the gingivus. By having an intermaxillary hook attached occlusally to the premolar band it causes less of a downward pull and does not make as much of a leverage on the premolar as if it were attached to the labial arch.

In beginning the construction of this type of appliance the plain bands are first made upon the anchor teeth which we will presume are the first molars. Even in those cases where the lingual arch is to be used as a regulating appliance, buccal tubes are soldered on the molar band parallel with the line of occlusion for the possible use of the labial arch with the extension spurs. I have observed a number of Lourie's cases in which nothing but the lingual arch was used, but in the majority of instances, buccal tubes were adjusted on the molar bands so that it would be a very simple matter to fit a labial arch if its use should become necessary. As stated before, the attachment of the lingual arch to the molar band may be fixed or removable, each of which has some advantage. The lingual arch which is soldered to the molar band is necessarily more sensitive as the entire amount of force or adjustment falls upon some of the teeth. With a removable lingual arch there is always some play or lost motion in the point of attachment regardless of how accurately it may be fitted. On the other hand the removable arch possesses an advantage in the hands of those who have had little experience with the use of this device, because it is possible for a novice to remove the lingual arch and bend or shape it outside ot the mouth. It must be remembered, however, that the removable type is not as effective in the hands of the experienced operators as the fixed type or that type of the lingual arch soldered directly to the molar band. There might be some objection to placing a buccal tube upon an anchor band for the possible use of the labial arch owing to the fact that some would make us believe that it would be annoying to the cheek. A small 17 gauge tube on the buccal surface of the molar band properly placed and fitted causes no annoyance to the patient. These buccal tubes always

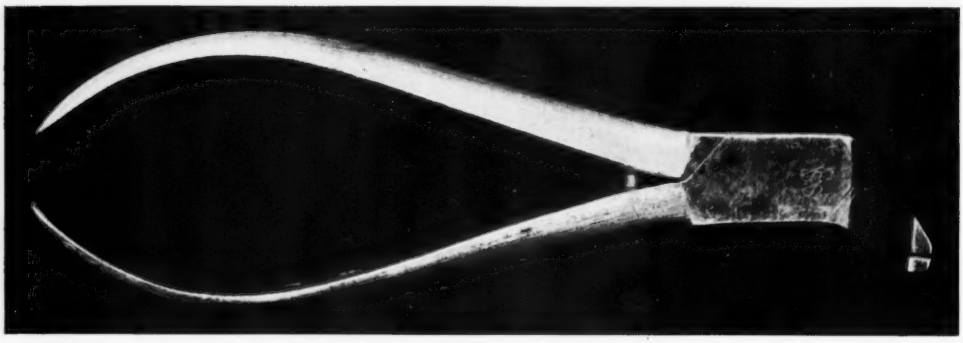


Fig. 2.

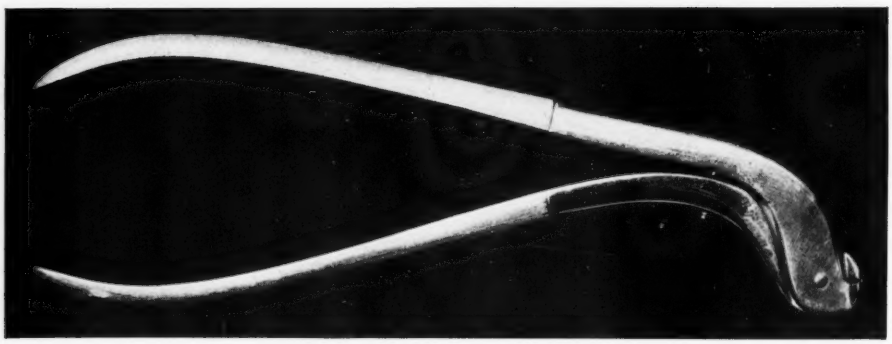


Fig. 3.

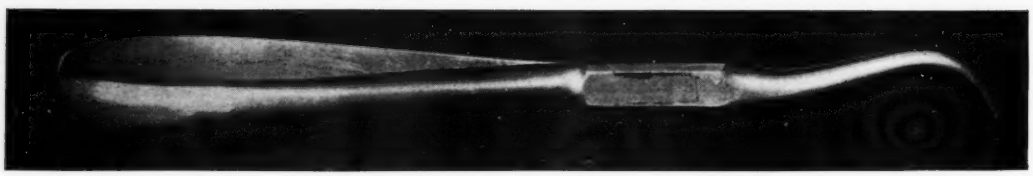


Fig. 4.

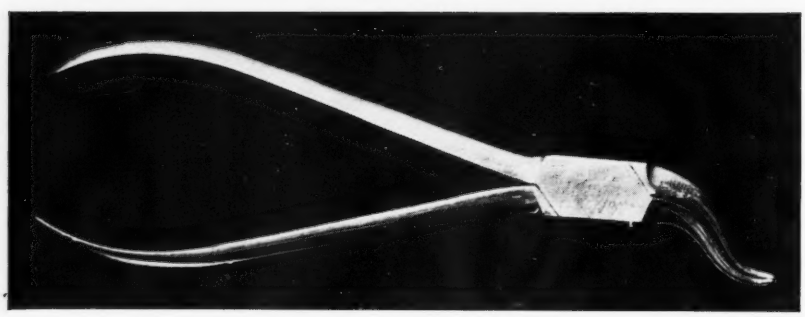


Fig. 5.

make it possible to employ a labial arch for a short time to assist movement which the lingual arch is not producing. If the lingual arch does not accomplish the tooth movement desired, usually the fault lies with the operator and not the appliance, because I have seen the most difficult types of tooth movement accomplished with the lingual arch and if I had not seen the case before and after treatment I would have stated that such a movement could not be accomplished with the type of appliance used.

It has been stated before that the lingual arch is very delicate and inconspicuous and may appear to some practitioners as being incapable of producing as large a variety of tooth movements as has been accomplished. We all are aware of the fact that tooth movement can be accomplished by a very delicate force, but this force should be constant in direction, and nothing is more capable of producing a force in a constant direction than a small delicate lingual arch. It must also be remembered that any appliance moves a tooth either by pushing or pulling and it seems to make no difference as to the physiological activity whether it is a pulling or pushing force.

I might mention here a few requirements of the ideal regulating appliance. We have various appliances described in the literature as being ideal, but when we analyze them carefully from a mechanical and physiological standpoint they are very often lacking in some respect. The first requisite of a regulating appliance is that it shall exert force in such a manner as to be in accord with the physiological laws, but it must not interfere with the forces of occlusion any more than possible. The large amount of damage being attributed to the use of bands at the present time should cause orthodontists to stop and consider that bands of previous years which have been considered harmless may have caused a large amount of tissue changes which develop later in life. Consequently the tendency should be toward the elimination of bands. With the use of the lingual arch and the labial arch as described in this article only two bands are necessary. It seems certain that this appliance will more nearly approach the ideal condition than any appliance that has been used heretofore.

In using the lingual arch the force is exerted by two means, either by bending the lingual arch or by use of the wire stretchers. Wire stretchers were first employed in the practice of orthodontia by Angle. The type of instrument which he placed upon the market is shown in Fig. 2. They consist of round beaks with very strong handles. By placing the beaks over the wire and squeezing the handles together an indentation is made on the wire which increases its length. These wire stretchers should possess a screw as shown in Fig. 2 to control the distance to which the handles can be closed. Lourie has modified the wire stretchers by placing a small notch near the end of the beaks which assists in centering the wire stretchers upon the wire.

Because of the large size of the Angle wire stretchers and the difficulty of getting the beaks in the proper position in the use of the lingual arch, Lourie designed a smaller instrument as shown in Fig. 3. In bending the lingual arch, especially in the fixed type, it is necessary to have a pair of pliers with which it is possible to grasp the lingual arch at right angles to the direction in which we wish to apply the force. Fig. 4 illustrates what is known as the Bogue pliers which are very useful in bending the lingual arch. They are made in two sizes,

the larger size shown in Fig. 4 being the most satisfactory. Another very useful form of pliers is Lourie's modification of the How pliers (Fig. 5). While very convenient and a source of great satisfaction, it is not absolutely necessary that the operator possess Bogue pliers of this special modification of the How pliers. It is not my intention in this article to go into detail in regard to bend-

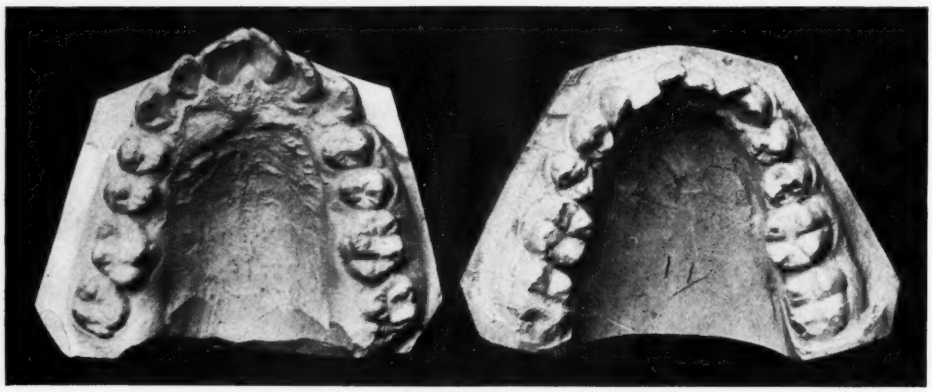


Fig. 6.

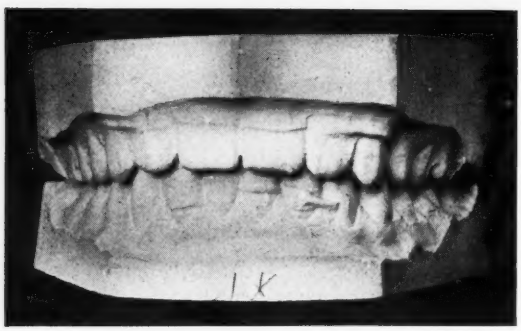


Fig. 7.

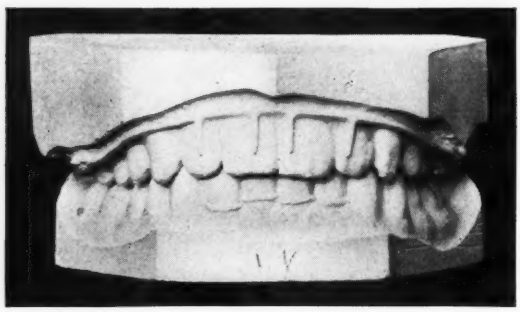


Fig. 8.

ing or stretching the wire, but simply to show the few instruments that are really necessary, and the simplicity of the whole plan in comparison to some of the other devices which are on the market that require many special instruments and a large number of especially made parts.

It is the simplicity of the combination of the labial and lingual arch both as a retaining and regulating appliance that appeals to me more than anything I

have seen for some time. In a personal communication Lourie stated that the combination of the lingual and labial arch was first employed in a case which was retained by the use of bands and spurs in which he experienced considerable trouble in keeping the teeth where they belonged, because the teeth relapsed on the removal of the bands before the closing of the proximal spaces and before the formation of the normal proximal contact. The occlusal view of this case is shown in Fig. 6. This is one of a type which is more or less difficult to retain and has probably been encountered by all who are engaged in the practice of orthodontia. The malocclusion is not extreme and the principal movement required is the expansion in the canine region with a rotation of all the incisors in the upper arch and practically all in the lower arch. The old plan of rotating these incisors by means of ligatures and spurs is partly responsible for the large number of failures experienced in this type of cases. Fig. 7 shows a study model made while the bands and spurs were used in retaining the upper and lower teeth. The position of these teeth as shown in the study model would in-

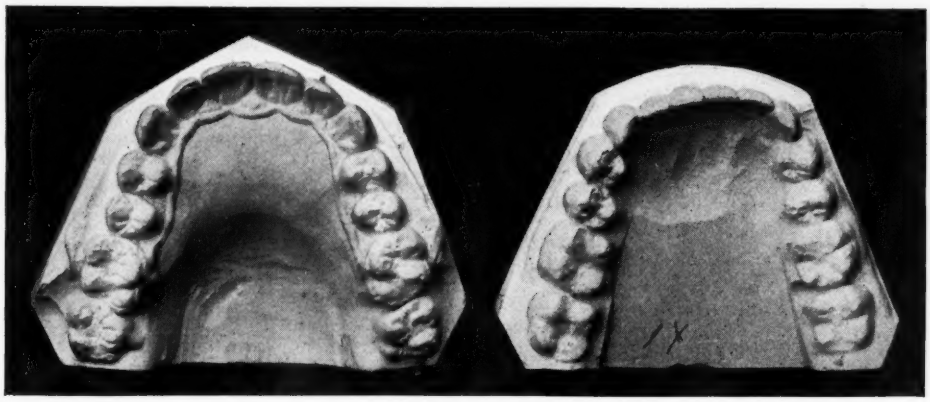


Fig. 9.

dicate that they had been moved to the proper position and show what would be called a finished result by a large number of men. However, the history of this case indicates that upon the removal of the bands (because of the lack of the proximal contact) the teeth drifted back toward the old positions. As a result of the difficulty encountered in this case by the use of bands, it was necessary to devise some plan which would eliminate the bands and allow the proximal contact of the teeth. Not only was it necessary to keep the expansion in the canine region but it was also necessary to prevent a torsiversion of the incisors during the process of retention. This meant there must be some means devised by which pressure could be made on the angles of the incisors to keep them in their proper position. Consequently the lingual arch was used and the labial arch with the spur extensions, as shown in Fig. 8. It will be seen that the bands are placed upon the first molars carrying small buccal tubes. Instead of being placed near the gingivus as in that case, at the present time the labial arch would be placed above the gingivus with the result that nothing would show upon the teeth except a small labial spur. The position of the lingual arch in this case, as shown in Fig. 9, differs materially from that used at the present time. In this case it will be seen that the lingual arch rests against the pre-

molars near the gingival margin, which plan has been found to be productive of more or less gingival irritation. Lourie states that food lodges in between the arch and the teeth with the result that severe inflammation occurs in the gingival region. Therefore at the present time the lingual arch is bent away from the gingival portion and rests against the lingual surface of the premolars.

This case is interesting and a matter of history because it shows as far as is known the first use of the combination of the labial and lingual arch with spur extensions on the labial arch to prevent rotation of the incisors and thereby overcome the difficulties encountered in the use of bands by many orthodontists. Even if it is possible to construct the band and not have it interfere with the proximal contact we would still have the unsightly appearance of the band upon the labial surface which is much more conspicuous than small spurs resting against the labial surface of the incisors. There would also be a greater tendency for decay owing to the loosening of the bands than from the small contact of a labial spur extension against the labial surface of the tooth which is very easy to keep clean owing to the small amount of tooth surface involved.

In the next installment of this article I will take up the use of the labial and lingual arch and the treatment of certain types of malocclusion and show the efficiency, conspicuousness and delicacy of the appliances as compared to some others.

THE RESULT OF UNPHYSIOLOGICAL PRESSURE EXPRESSED IN TWO CASES

By Clinton C. Howard, D.D.S., Atlanta, Ga.

Professor of Orthodontia, Southern Dental College, Atlanta, Ga.

HISTORY OF CASE.

YOUNG lady, age 17. Open bite or infra-occlusion of the upper teeth as far back as the distal cusps of the six year molars. Arches lacking lateral development to the extent of about one-half inch. Class I mutilated, the lower left lateral having been extracted for the "straightening of teeth" at the age of ten. Upper incisors protruding, lower retruding.

ETIOLOGY.

Thumb-sucker at age of five. Habit broken by use of a solution of cayenne pepper and vinegar. Nasopharynx normal. Mouth-breather.

TREATMENT.

A description of the treatment in detail seems presumptuous as such was along the well known orthodox lines and in accordance with diagnosis. It might be mentioned that the Angle pin and tube appliance was employed on such teeth as demanded a definite root movement, and it is concerning the pin and tube in conjunction with vertical loops in arch wire, which were employed in case from Figs. 1 to 7, that I wish to emphasize.

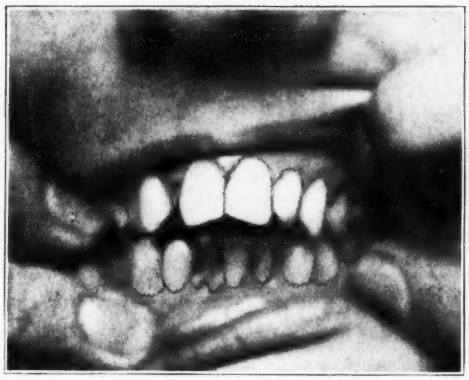


Fig. 1.—Before treatment.

Fig. 2.—During treatment, protrusion reduced, space opened for lower lateral.

Fig. 3.—Open bite closed. Median line shifted. Elastics in region of cuspids.

Fig. 4.—Ready for retention.

Fig. 5.—Retention in place. Lower left lateral supplied with porcelain facing tacked to lingual retaining wire.

Fig. 6.—Loss of process.

It has been advised that a spring force obtained by opening the loops between two pin and tube attachments would give an ideal pressure for obtaining increased space between attachments, and to be sure, space is obtained, but the movement of teeth involved is "constantly changing" in many directions and therefore a methodical reproduction of the alveolus is impossible. It is contended by the writer that illustrations 7 and 8 clearly demonstrate the unphysiological principle as above described.

The loops in the arch were almost completely straightened in carrying cuspids laterally. The loss of process on the left cuspid (Fig. 6), is practically complete, that of right (Fig. 7), about half complete.

To quote from Angle in this regard (*Items of Interest,* Sept., 1916, pp. 992 and 993), he states the following: "the direction of force is constantly changed, thus mischievously disturbing the function of cells of the peridental

Fig. 7.—Loss of process.

Fig. 8.—Loss of process.

membrane and alveolar process, and this must be repeated with each change in the form of the loop." He further states that, "this continual pushing and pulling of the tooth backward and forward in its socket is in direct violation of the physiology of cell function, and must inevitably cause irritation, pain and absorption of tissue."

The same principle is further substantiated in Fig. 8. It will be noted that the process has been lost to the extent of about one-half of the root surface (banded tooth, right lower central). This tooth was turned, most simple to correct, yet in the course of three months it was rotated and then allowed to relapse three times, after which the tissue broke down as illustrated. No pin and tube were employed, but correction was made by a spur on the band and ligature over the arch-bar, hence again the orthodontist is impressed with the fact that his mechanical efforts must be "in accord with and wholly subservient to the physiological and physical requirements of treatment."

HISTOLOGICAL STUDIES OF THE DEVELOPMENT OF THE ALVEOLUS OF YOUNG RHESUS MONKEYS

By F. Hecker, B.S., D.D.S., A.M., M.D.

Director of Research Laboratory of the Dewey School of Orthodontia, Kansas City, Mo.

IT is commonly taught in the laboratories and in the lecture room that the alveolus is dependent on the periosteum for its development and regeneration. This theory must now be set aside as incorrect, for the reason that Macewen,[1] of Scotland, has shown experimentally that the periosteum is not concerned in the development or the regeneration of bone, but that the periosteum is a limiting membrane for developing or regenerating bone. The findings of Macewen have been recently duplicated by Dobrovolskaia,[2] of Russia, in his studies of the development and the regeneration of bone. Learning these findings the orthodontist at once becomes interested, for his work is primarily with the destruction and the regeneration of bone when the teeth are moved to their correct anatomical position.

The alveolus is not laid down in its development like the bones of the forearm which are laid down in cartilage, but instead it is laid down in membrane. This being the case no transitional changes occur in a conversion of the bone cell into the cartilage cell and the osteoblast.

Careful examination of sections made from the jaw of young rhesus monkeys shows no active foci of developing alveolus along the periosteal border. The probable explanation for this is that the lateral plates of the alveolus are the first to be laid down. After they have been laid down the periosteum makes itself fast to the lateral plates and now performs the functions given it by Macewen, namely, that of a limiting membrane. This function of the periosteum prevents a thickening of the lateral plates of the alveolus and thus gives them the elasticity needed by the developing tooth, which we will take up more in detail in another part of this paper. In addition to the periosteum, we are also compelled to consider the alveolar dental ligament, for the reason that this tissue is an exact counterpart histologically of the periosteum and one of its functions is that of a limiting membrane for the alveolus which forms the root socket.

If the periosteum and the alveolar dental ligament were actually concerned in the development or the regeneration of the alveolus we would find present in the tissues in the immediate vicinity of their attachment to the alveolus, cells which morphologically are the same in type as the osteoblasts observed along the border of the developing islands of alveolus. Not finding cells of this type present we are compelled to set aside the former teaching that the periosteum and the alveolar dental ligament are concerned in the development or the regeneration of the alveolus. By the foregoing findings we are verifying the researches of Macewen and Dobrovolskaia.

[1]Macewen: The Development of Bone.
[2]Dobrovolskaia: The Regeneration and the Growth of Bone in the Test Tube. Russkiy Vrach, St. Petersburg, Vol. xv, No. 18.

The general picture presented of developing alveolus at the time of the development of the permanent tooth histologically, shows the alveolus to be very loosely constructed in its central portion while the lateral plates of the alveolus are very compact. Occasionally we observe a haversian canal or a medullary space in the substance of the lateral plates of the alveolus. Along the inner borders of the alveolus one notes many osteoblasts. The lateral plates of the alveolus are separated from the inner portion of the alveolus by long irregular medullary spaces. In the central area of the alveolus there are islands of alveolus in different stages of development which are variable in shape, size and arrangement.

Because of the loose construction of the alveolus the developing permanent tooth finds little or no resistance and its development is therefore not retarded. From this we at once realize the importance of the thinness of the lateral plates

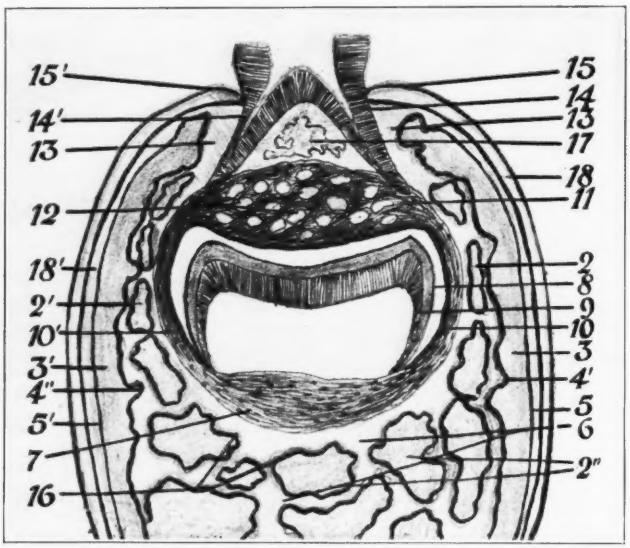


Fig. 1.—Schematic drawing showing the conical shape of the development of a superior first premolar and the relation of the alveolus and immediate dental tissue.

of the alveolus, for if the elasticity of the lateral plates was absent, the pressure consequent to the pressure created by the lateral development of the tooth would be so great that pain would inevitably occur and in addition thereto a deformed tooth. Thus we can readily see that nature has wisely provided for the future requirements by first laying down the lateral plates of the alveolus which form the matrix, the inner portion is filled with incompletely developed alveolus and roots of the developing teeth. The root of the tooth by its development causes to be produced a space which is gradually filled in by the growth of the alveolar islands.

As stated in a previous portion of this paper, as the roots of the tooth develop there is a lateral expansion of the lateral plates of the alveolus. Being unable to reduce the gross specimen or to enlarge it to such a size as would show the relation of the developing alveolus, the crown and the roots of the developing tooth and all of the dental tissues, schematic drawings were made from the gross specimens.

In Fig. 1 beginning at 15 and 15′ we have the mucosa of the gingiva; 14 is the palatine root, while 14′ is the buccal root; 13 and 13′, the alveolar dental ligament; 17, an island of alveolus lying between the palatine and the buccal roots of the deciduous tooth; 18, the mucosa; 11, the upper portion of the capsule which surrounds the crown of the permanent tooth; 12 shows round spaces which have a smooth border in the substance of the capsule which surrounds the crown of the developing tooth,—histologically these spaces are lymph spaces; 18′, the periosteum, 2 and 2′, islands of alveolus between the capsule 10 and 10′ which surrounds the developing tooth and the lateral plates of the alveolus 3 and 3′; 8, the enamel of the crown of the developing tooth; 9, the dentine of the developing tooth; 10 and 10′, the capsule surrounding the developing

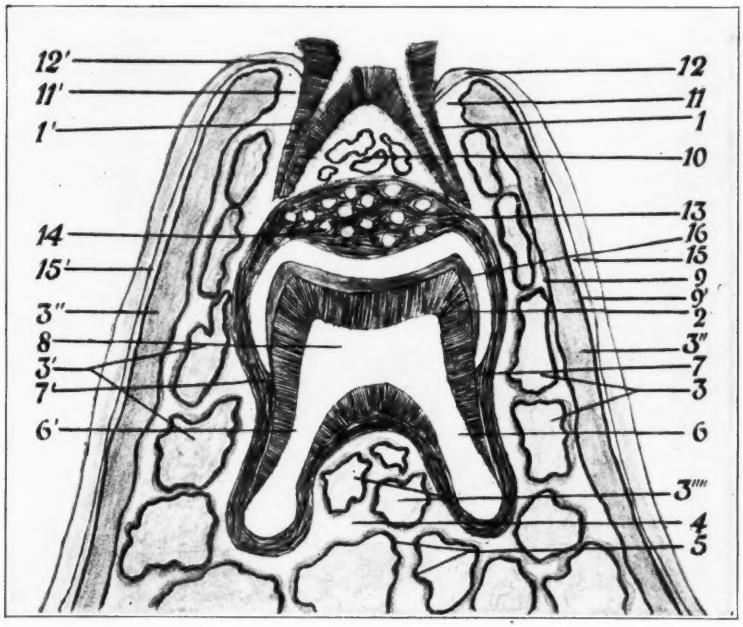


Fig. 2.—Schematic drawing showing the relation of the developing tooth and alveolus surrounding it.

tooth; 3 and 3′ the lateral plates of the alveolus; 4 and 4′, the inner borders of the lateral plates of the alveolus (it is along these borders that one observes the osteoblasts with the higher magnifications); 5 and 5′, the periosteal borders of the lateral plates of the alveolus; 6, the intermedullary spaces; 7, the lower portion of the capsule surrounding the crown of the developing tooth; 2′, island of developing alveolus; 16, the heavy borders of the developing islands of alveolus (it is also along these borders that one notes the osteoblasts with the higher magnifications).

The next schematic drawing (Fig. 2), shows the relation of the roots of the deciduous tooth, the crown of the permanent tooth, and the roots of the permanent tooth about half developed; 12 and 12′ show the mucosa at the gingiva; 11 and 11′, the alveolar dental ligament; 1, the palatine root; 1′, the buccal root; 10, small island of alveolus between the roots of the deciduous tooth; 13, the upper part of the capsule surrounding the developing tooth; 14, spaces in the substance of the capsule which histologically are lymph spaces; 15 and 15′, the

periosteum covering the lateral plates of the alveolus; 16, the enamel of the crown of the developing tooth; 9, the inner border of the lateral plates of the alveolus (with the higher magnifications no osteoblasts are noted along this border); 9′, periosteal border of the lateral plates of alveolus; 2, the dentine of the developing tooth; 3″ and 3″, the lateral plate of the alveolus; 7 and 7′, the capsule surrounding the developing tooth a short distance below the future gingiva; 8, the space which is occupied by the pulp; 3 and 3′, islands of alveolus which lie between the inner border of the lateral plates of the alveolus 9 and the capsule 7 and 7′ which surrounds the developing tooth (with the higher

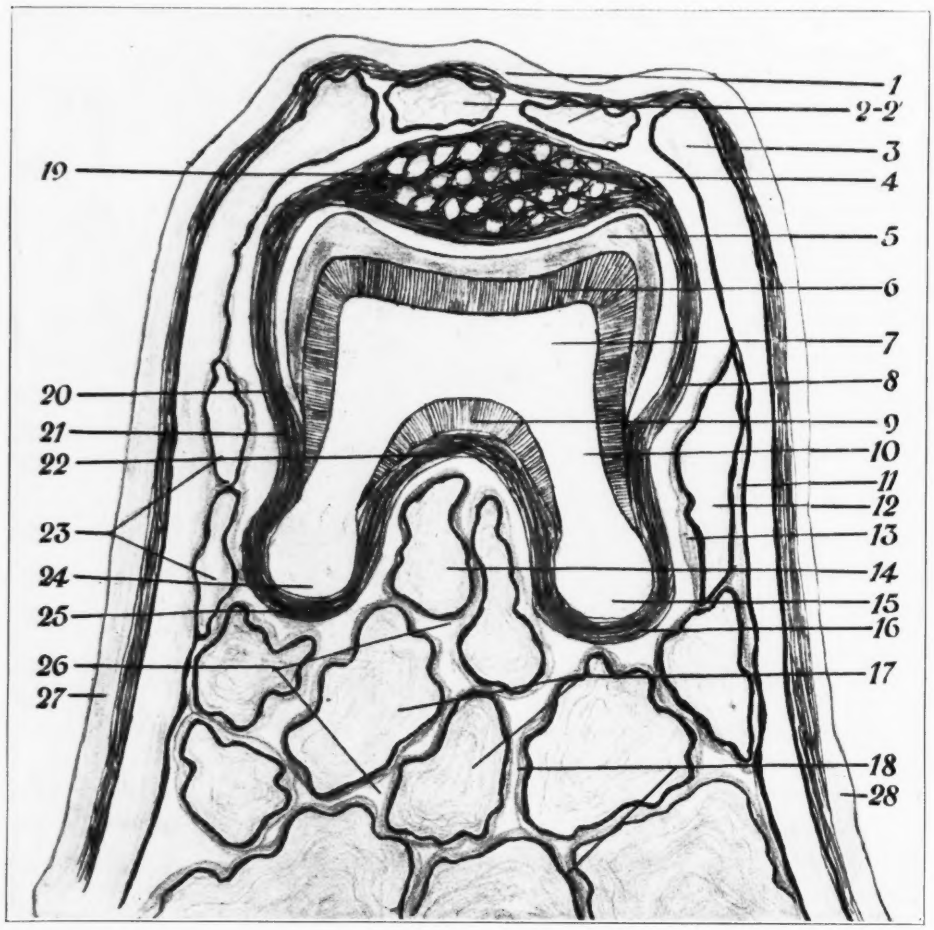


Fig. 3.—Schematic drawing showing the relation of the developing tooth and the developing alveolus of superior second molar.

magnifications we observe many osteoblasts along the border of the alveolar islands); 6 and 6′ are the future root canals of the developing root; 4 shows the intermedullary space; 5, the borders of alveolar islands along which the osteoblasts are observed.

Fig. 3 illustrates an early developmental stage of a second superior molar. 1 is the mucosa; 2 and 2′, islands of alveolus; 3, lateral plate of the alveolus; 4, the upper portion of the fibrous capsule surrounding the developing tooth; 5, the enamel of the crown of the developing tooth; 6, the dentine; 7, the pulp

of the developing tooth; 8, the fibrous capsule surrounding the developing tooth; 9, the developing dentine in the bifurcation of the roots; 10, the future root canal of the developing tooth; 11, the inner border of the lateral plate of the alveolus (along this border one notes many osteoblasts); 12, island of alveolus lying between the inner border of the lateral plate of the alveolus 11 and the capsule surrounding the developing tooth 8; 13, the border of the island of alveolus. (It is along the borders of the alveolar islands that one observes many osteoblasts); 14, island of alveolus lying between the palatine root 15 and the buccal root 25; 15, the palatine root (note the bulging of the dental pulp); 16, the capsule surrounding the developing tooth; 17, islands of alveolus; 18, borders of the alveolar islands. (It is along these borders that one notes many osteo-

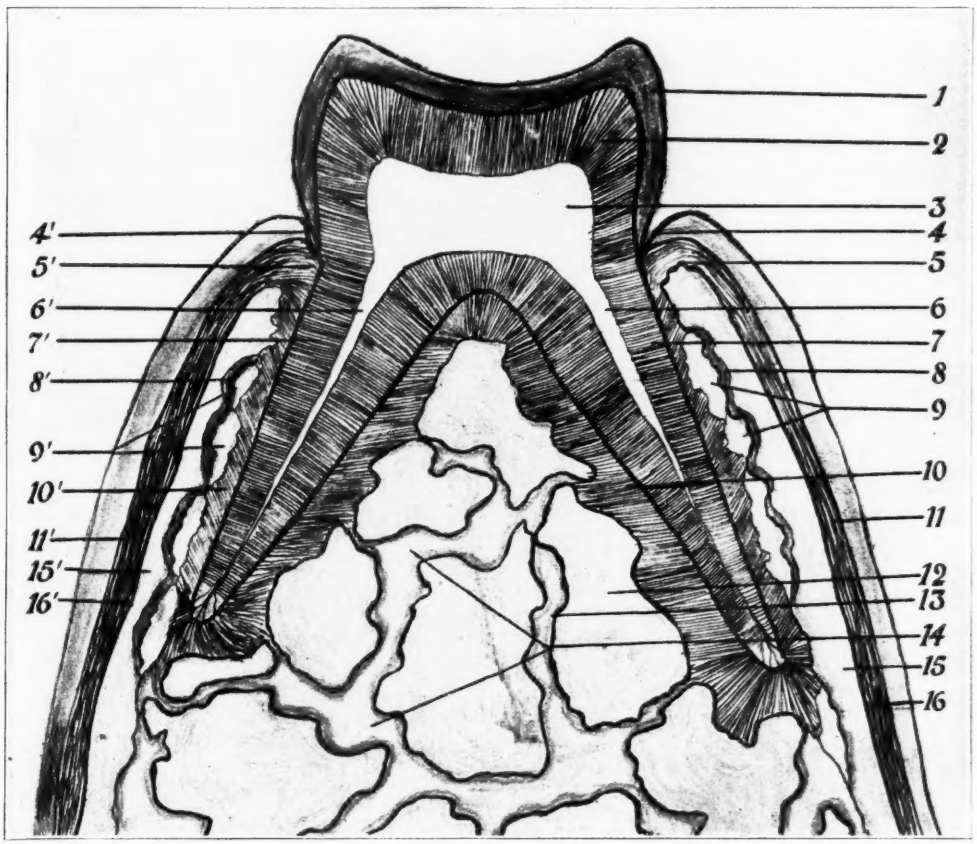


Fig. 4.—Schematic drawing showing the relation of the completely developed roots of a superior first molar and the relation of the alveolus to them.

blasts); 28, mucosa; 19, vacuolated spaces contained in the substance of the capsule which histologically are lymph spaces; 20, shows the direction of the fibrous capsule a short distance above the future gingivus; 22 shows that no union has occurred in the fibers of the capsule at this stage of the development of the tooth; 23 shows the islands of the alveolus, 24 is the buccal root; 25, the capsule surrounding the developing root; 26, the intermedullary spaces between the islands of alveolus; 27, the mucosa.

The next drawing (Fig. 4) represents a completely erupted and developed

first superior molar. 1 is the enamel; 2, the dentine; 3, the pulp; 4 and 4′, the gingiva; 5 and 5′, the alveolar dental ligament near the gingiva; 6, the palatine root; 6′, the buccal root; 7 and 7′, the dentine of the root; 8 and 8′, the inner borders of the lateral plates of the alveolus; 9 and 9′, alveolar islands lying be-

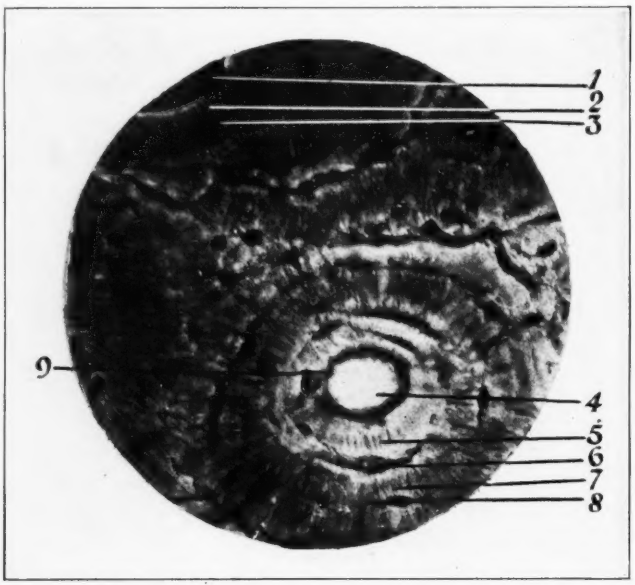


Fig. 5.—Haversian system bone which is primarily laid down in cartilage.

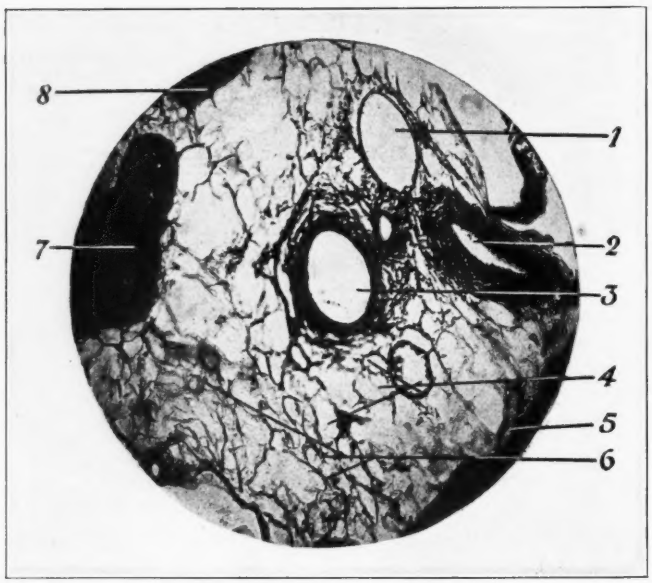


Fig. 6.—Human alveolus showing the medullary spaces and vascularization of same. Compare this illustration with Fig. 5.

tween the inner border of the lateral plates of the alveolus; 8 and 8′, the alveolar dental ligament 10′; 10, the alveolar dental ligament on the inner surface of the palatine root; 10′, the alveolar dental ligament on the outer surface of the buccal; 11 and 11′, the periosteum; 12, an island of alveolus on one border of

which the alveolar dental ligament is attached; 13, the inner border of the island. (It is along this border that one observes many osteoblasts); 14, the intermedullary spaces between the islands of alveolus; 15 and 15′, the lateral plates of the alveolus; 16 and 16′, the periosteal borders of the alveolus.

We have now shown the relation of the developing tooth to the developing alveolus schematically, and from the drawings learn that as the tooth develops there is a lateral expansion of the lateral plates of the alveolus and that the space thus created is filled in with alveolus at a future time. Let us now continue our study of the alveolus with some photomicrographs made from sections.

In Fig. 5 we have bone which is laid down in cartilage. 1 is a portion of an haversian canal; 2 are the canaliculæ; 3 shows the lacunæ; 4 is a complete

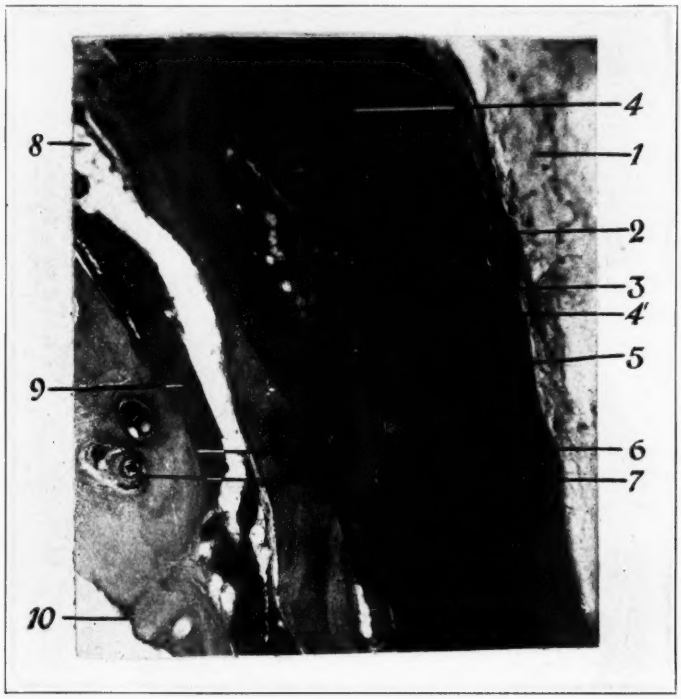


Fig. 7.—Showing the compactness of the lateral plate of the alveolus and the medullary spaces contained in it.

haversian canal; the canaliculæ communicate with the haversian canal and the lacunæ 6, while 7 are canaliculæ communicating with the lacunæ 6 and the lacunæ 8; 9 is the lining of the haversian canal. Studying this picture we at once note that the bone is very compact, and is laid down concentrically around the haversian canal.

The next photograph (Fig. 6) is from a medullary area in the substance of the completely developed human alveolus. Beginning at 1 we have the lymph vessel; 2 is an artery; 3, a vein; 4, fat cells; 5, alveolus; 6, areolar tissue; 7, the alveolus; 8, the alveolus. This picture shows conclusively that the alveolus is very vascular and that it is very loosely constructed when compared to Fig. 5.

Fig. 7 shows the lateral plate of the alveolus of the rhesus monkey. Beginning at 1 which is the periosteum and advancing to 2 which is the periosteal

border of the alveolus; 3 is the lateral plate of the alveolus proper, while 4 is a medullary space near the periosteal border; 5, the inner border of the alveolus (it is along this border that we observe the osteoblasts); 6, the border of the island of the alveolus which faces the border of the lateral plate of the

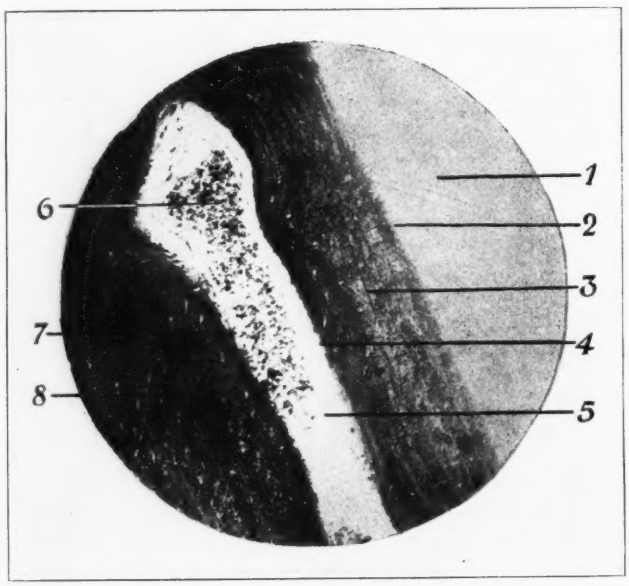


Fig. 8.—A medullary space in the alveolus which also shows the compactness of the lateral place and the density of the periosteum.

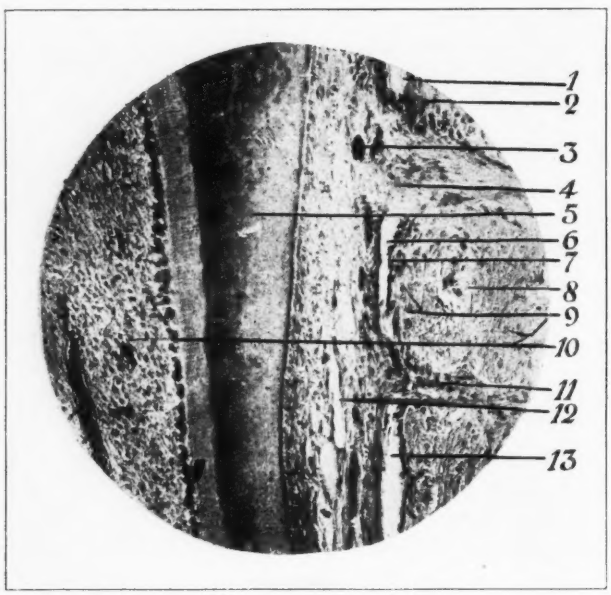


Fig. 9.—The relation between the developing root and the alveolus.

alveolus; 7, small medullary space which lies between the inner border of the lateral plate of the alveolus 3 and the border of the alveolar island 9; 9, the outer border of the alveolar island facing the capsule surrounding the developing tooth. Careful observation of this picture does not show any cells present on the periosteal border of the lateral plates of the alveolus.

Fig. 8 shows a medullary space in the substance of the lateral plate of the alveolus near the periosteal border. 1 is the periosteum (this picture was made very dense, hence no fibers are shown); 2, the periosteal border of the lateral plate of the alveolus; 3, the alveolus lying between 2 and the border of the medullary space; 4, the border of the medullary space; 5, the medullary space in the substance of the alveolus of the lateral plate; 6, fine granular debris and erythrocytes; 7, a border of the medullary spaces; 8, lacunæ of the alveolus.

Let us now study Fig. 9 which is a photograph of an area showing the developing root of the tooth and the developing alveolus. 1 is a medullary space between the alveolus and the alveolar dental ligaments; 2, a portion of an island of alveolus; 3, a cross section in the substance of the alveolus; 4, a bundle of the alveolar dental ligament passing between islands of the alveolus; 5, the developing root of the tooth; 6, a medullary space between the alveolus and the al-

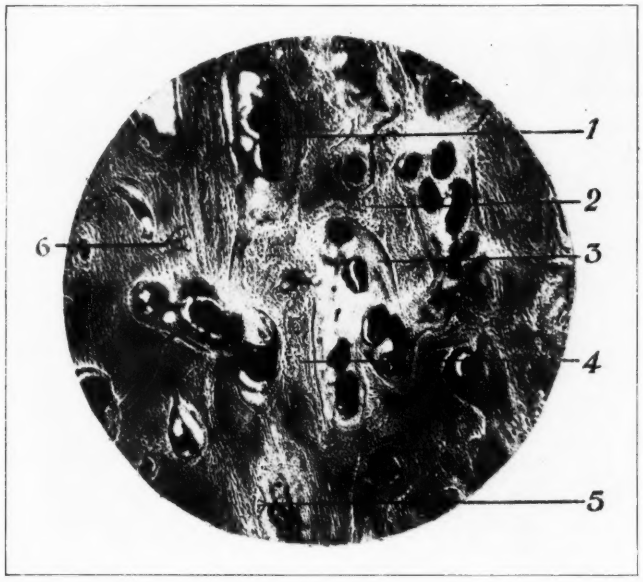


Fig. 10.—An area of the alveolus between the roots of a developing tooth.

veolar dental ligament; 7, a border of the alveolus along which one observes a few osteoblasts; 8, an island of the alveolus; 9, lacunæ of the alveolus; 10, the odontoblasts; 11, another bundle of the alveolar dental ligament passing between the islands of alveolus; 12, a longitudinal section of a blood vessel in the alveolar dental ligament; 13, medullary space between the alveolus and the alveolar dental ligament.

In Fig. 10 is shown the area midway between the developing roots of a permanent molar. 1 is a medullary space; 2, an area around a medullary space in which the process of development is almost completed; 3, an area in the substance of the alveolus which is developing; 4, the lacunæ commencing to arrange themselves; 5, osteoblasts; 6, an area of partial development of the alveolus. This area of alveolus shows us that at this time there are many foci of active developing bone centers.

In Fig. 11 is shown a field which lies directly between the bifurcation of

the roots of the developing tooth. At 1 is shown medullary spaces. The developing bone in the immediate vicinity of these medullary spaces has commenced development; 2 is an area of early development of the alveolus showing small clumps of osteoblasts; 3, an island of alveolus in which the lacunæ have

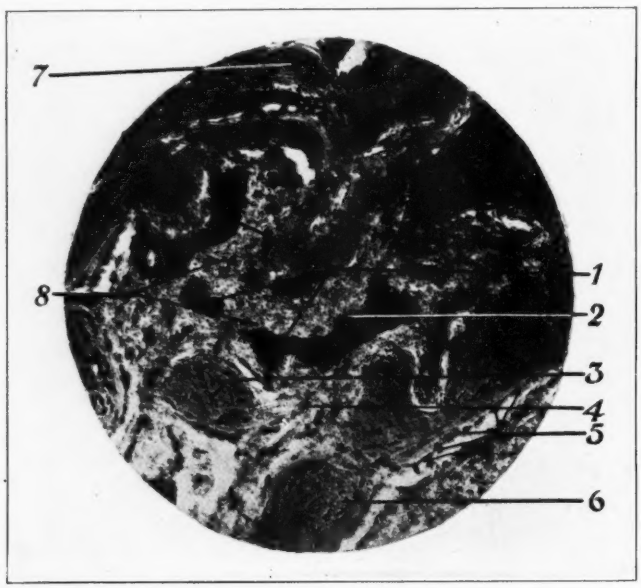


Fig. 11.—An area of developing alveolus.

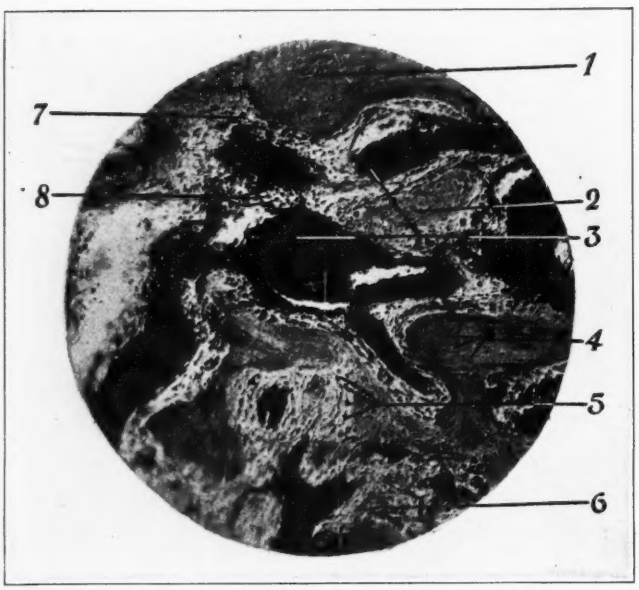


Fig. 12.—An area of developing alveolus in the vicinity of the palatine root.

commenced to arrange themselves (on the border of this island one notes osteoblasts); at 4 one observes a row of osteoblasts free in the medullary substance; 5 shows osteoblasts along the border of an island of the alveolus; 6, a partially completed island of alveolus; 7, an area which is composed of a few lacunæ

surrounded by osteoblasts; 8, the medullary substance which is rich in erythrocytes and osteoblasts.

Fig. 12 shows an area in the immediate vicinity of the palatine root. 1 is an island of alveolus along one border of which osteoblasts are observed; 2, an

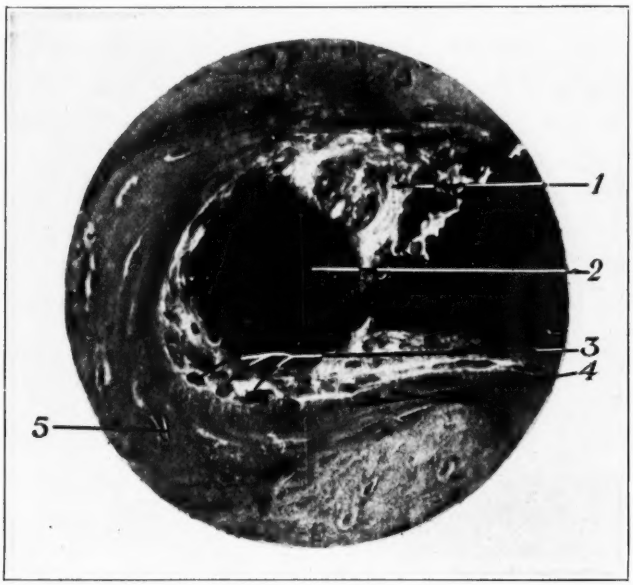


Fig. 13.—A high magnification of the medullary space in the alveolus.

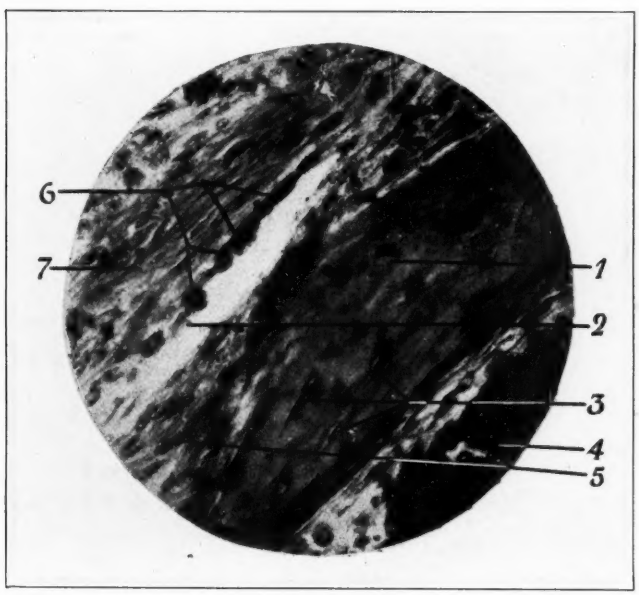


Fig. 14.—A high magnification showing many osteoblasts.

island of alveolus the borders of which show an active development of the alveolus; 3, a large medullary space; 4, the lacunæ of the alveolus (along the border of the island in which they are shown one notes many osteoblasts); 5 shows very distinctly osteoblasts present in a very loosely constructed mass of alveolus;

6 shows osteoblasts present in the medullary substance; 7, a few osteoblasts present in the medullary substance near the island of alveolus 1; 8, an early stage in the development of the alveolus above the medullary space 3.

Fig. 13 is a higher magnification than any of the photographs shown thus far. 1 shows a mass of fine granular debris, erythrocytes, and a few osteoblasts; 2, the medullary space proper; 3, osteoblasts along the border of the alveolus facing the medullary space; 4, canaliculæ which communicate with the lacunæ of the alveolus and the medullary canal; 5, lacunæ of the alveolus.

In Fig. 14 is shown an area in the substance of an island of alveolus. 1 shows the alveolus proper; 2, a medullary space extending upward into the substance of the alveolus; 3, lacunæ in the substance of the alveolus; 4, a large medullary space along the border of the alveolus (facing this space one notes a few osteoblasts); 5, osteoblasts along the border of the alveolus facing the medullary space 2; at 6 the osteoblasts stand out in bold contrast to the early developing alveolus; 7 shows the lacunæ faintly in the substance of the young alveolus.

From the foregoing evidence presented by schematic drawing and photomicrographs which were made from sections of the jaw of the rhesus monkeys we are no longer dealing with empiric teaching, but are using material at first hand which does not agree with former theories, namely, that the periosteum is necessary in the development and the regeneration of bone. On the other hand we believe that the periosteum is a limiting membrane for the development and regeneration of the alveolus. The findings thus offered confirm the findings of Macewen and Dobrovolskaia.

GROWTH

By Lafayette B. Mendel and Thomas B. Osborne, New Haven, Conn.

From the Sheffield Laboratory of Physiological Chemistry in Yale University and the Laboratory of the Connecticut Agricultural Experiment Station at New Haven, Conn.

THE solution of the chemical problems of growth has been approached along various avenues. One of these, and perhaps the earliest to be followed by any considerable number of investigators, leads to the *chemical analysis* of both growing and fully grown individuals. Its primary object is to disclose the characteristics of growth by a comparison of the chemical composition of organisms at various stages of their development. Despite the considerable abundance of data thus accumulated, relatively little of major importance has been contributed thereby to our knowledge of the subject. Growing cells and tissues may be morphologically and functionally unlike the fully developed structures into which they are finally transformed, but the analytical methods of the chemist of today are not sufficiently refined to reveal any eminently unique features of make-up characteristic of growth.

It is true that embryonic and other growing tissues are comparatively rich in water, and that the water-content diminishes to a certain degree with increas-

ing age; but aside from such rather inexpressive generalizations respecting quantitative variations in composition at different stages of growth, no striking facts have yet been furnished by the devices of tissue analysis. Equally unprogressive has been the study of the comparative biochemistry of growth in the direction of qualitative analysis. From a purely biological standpoint it is of interest, and a result perhaps to have been anticipated, that there is a fixity, so to speak, in the composition of animal structures at various sizes of the same individuals. The number of the cells or the volume of each of them may be increased enormously; yet, broadly considered, the available analytical data show no striking differences in the chemical organization of the resultant protoplasmic mass in comparable tissues at various periods. In other words, aside from transitory depositions of reserve materials such as glycogen or fat, muscle remains alike in its gross composition, and the nervous substance exhibits essentially the same chemical characteristic components, independent of age, diet, or environmental condition.

Several years ago a study of the composition of the bodies of mice kept upon diets of widely different types led one of us to express the outcome in these words: "The constant composition of the organism which is exhibited by our analysis, does not speak in favor of the possibility of depriving the body by alimentary procedures of any constituent excepting fat that is essential for its functions. On the contrary, it appears that the organism adheres to its proportionate composition. A deficiency in the diet, a lack of some food component, is not responded to by growth in which the tissue produced is chemically abnormal and shows a depletion in the missing factor. Its composition remains unaltered. Normal growth can proceed only when all the important constituents are assimilated in the proportions in which they make up the body. Losses are sustained only by the *uniform* disintegration of the tissues, whereby their relative composition remains unaltered."[1]

A more effective advance upon the chemical questions relating to growth has been made by the study of *nutrition* in this period of life. This more modern plan has meant a determination of what constructive units are essential for the building up of an adult organism, what materials must be furnished to the growing individuals, what possibilities of synthesis are inherent in them and will enable them to supply by construction the necessary tissue components. The successful pursuit of this method of inquiry depends upon the justifiable assumption, already mentioned, that protoplasm, if it is constructed at all, is not made into a fundamentally defective variety of diet, though deficiencies in the latter may lead to an unmaking of cells already developed.

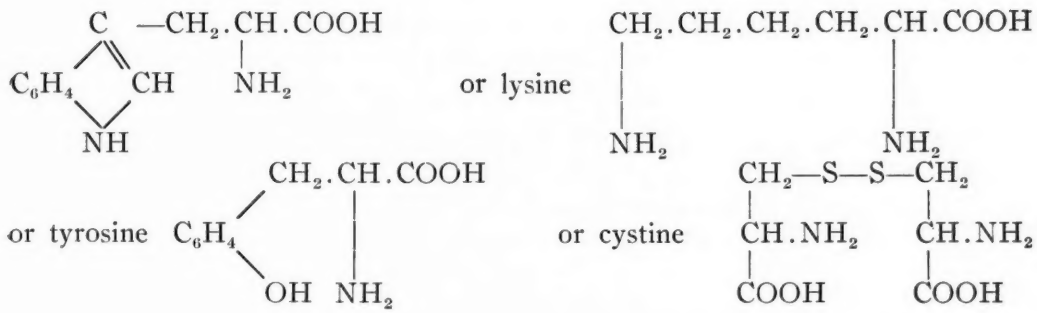
The questions relating to the initiation of growth and to the fundamental energy factors are not touched upon in this review. Certain modifying features of nutrition in growth are more or less obvious. The necessity for certain elements, like calcium, calls for no further comment here than to inquire to what extent the need of them is specific in growth. In the ordinary wear-and-tear of life, or what is technically designated as the maintenance metabolism, losses

[1]Mendel, L. B.: Der Einfluss der Nahrung auf die chemische Zusammensetzung des Tierkörpers. Biochemische Zeitschrift, 1908, xi, 281.

of structural elements call for restitution. In the case of the most of them we shall probably not err widely in saying that the metabolism of growth represents a highly exaggerated instance of the same needs but on a scale appropriate to produce increment instead of mere maintenance of body substance.

Modern chemical physiology has demonstrated in a convincing way that the diverse proteins which are now known to occur in nature can no longer be considered solely in a generic way in the roles which they play in the organism. These nitrogenous compounds lose their biological identity even before they leave the alimentary tract, by becoming disintegrated into the chemical units—the amino-acids—out of which the proteins are built up. In so far as these amino-acids merely serve as fuel, it seems to matter little what their precise nature is. All of them can be, and usually are, destroyed readily in the metabolism. Inasmuch as tissue proteins are broken down in a small, yet seemingly inevitable degree in the wear-and-tear, the problem of satisfactory restoration arises. During growth additional new protein molecules are to be provided. At the present time it may be said with confidence that many, though not all, of the amino-acids must be offered ready-made in the diet, because there is no evidence that they can be synthesized *de novo* even in growing mammals. For the lower forms of animal life this statement may not be valid, as it is not in the case of plants. In the higher forms, however, the exhibition of dietary proteins which are deficient in respect to their yield of any of the essential amino-acids may be expected to lead to suppression of growth and even failure of maintenance, depending on the degree and nature of the structural shortcomings.

The evidence in support of this general statement has resulted from the possibility of preparing a ration which is complete or adequate for growth in every respect other than the protein component. This latter factor can then be added experimentally in any way desired. The casein of milk is one of a few proteins which fail to yield the amino-acid glycocoll $\begin{matrix} CH_2.COOH \\ | \\ NH_2 \end{matrix}$ upon analysis. Tissue proteins, and particularly those of the omnipresent connective tissues, include a relatively large content of the glycocoll group in their make-up. Yet animals can be grown to maturity and into a second generation upon a diet containing the glycocoll-free casein as practically the sole source of food protein. Here, then, is a striking illustration of the capacity of a growing organism to supply, by synthesis, one of the essential amino-acid constructive units of its protoplasm. On the other hand, there are proteins, particularly of vegetable origin, which fail to furnish one or more of the amino-acids, such as tryptophane which tissue proteins also yield. As the result of very recent experimental investigation there is little room for doubt that all of these mentioned amino-acids must be furnished ready-made to an organism for the constructive uses of growth. The organic chemist will appreciate why the laboratory of the living cells may be unable to synthesize nuclei so complex as those of tryptophane or tyrosine and yet be competent to produce a comparatively simple product like glycocoll.



The best proof of the indispensability of some of the amino-acids has been furnished by actual feeding experiments. Without the proper complement of these units, even the best diet spells disaster; and the addition of the missing ones, either as such or in the guise of proteins containing them, brings renewal of growth proportionate, as a rule, to the extent to which the deficiencies are made good quantitatively as well as qualitatively. The lack of an essential protein factor need not be an absolute one to produce malnutrition. It has become apparent, as Abderhalden pointed out long ago, that where the organism cannot synthesize an essential fragment, the nutritive pace is set, so to speak, by the minimum of any indispensable dietary ingredient. In practice this means that however abundant in protein and seemingly "balanced" a diet may be from the standpoint of the theories of nutrition of a generation ago, it is certain to be inadequate for growth if the proteins are qualitatively unsuitable as in fact they may be if derived from a single source.

For the problems of practical dietetics and particularly of animal production it is further of interest to note that chemically identical proteins are apparently not present in animals or plants of different species unless they are biologically closely related. In so far as the differences are an expression of inequalities in the amino-acid make-up of the protein from these varied sources they are likely to have significance in the construction of a dietary suitable for growth. There are various protein by-products, for example from the cereal, milk and meat industries, which are available as low priced nutrients and the successful use of which must henceforth be determined, in so far as they enter largely into the rations of growing animals, by the standard of their competence to furnish the essential amino-acids suitably. It has been shown that unquestionable differences exist in the economy of correcting various inadequate protein foods with appropriate supplementary proteins. The problem seems in part at least to be one of suitably combining products that are deficient in one or more nutrient units so that the mixture shall not have any serious relative shortage of any one of them.

The upshot of these newer developments in the physiology of nutrition has been to give a new trend to the biochemistry of the proteins and to lend a greater importance to this pre-eminent group of food stuffs. Those whose field of interest lies far away from these strictly chemical aspects of nutrition will appreciate the comment of one of our colleagues (von Fürth) when he says: "I invariably experience a feeling of envy when I read the letters of Liebig, Wöhler, or Berzelius, and note how important an event for these fortunate in-

dividuals was the appearance of every scientific publication. With what devotion and joy they read and re-read every detail of even the smallest scientific contribution. Today, owing to the great mass of scientific literature, we are in danger of losing the naive pleasure which anything novel should afford; and we are likely to sacrifice the spirit of inquiry or inquisitiveness that attaches to the soul of the man of science. And so, today when the devotee of biochemistry, working in the sweat of his brow, is barely able to orient himself in the essentials of its literature, familiarity with its content has long since become an impossibility for him who stands apart from any immediate concern with such topics." (v. Fürth: Probleme, i, p. 2.)

And now, at a time when the energy problems of growth have reached a degree of solution that gives a clear and fairly comprehensive insight into this aspect of nutrition, so that this chapter of physiology can at length be reviewed with a fairly satisfactory understanding of what it involved, entirely new questions have thrust themselves into the foreground. Physiologists have long realized that the ideal way to study the problems of nutrition would be by feeding artificial mixtures of the isolated and purified nutrients. The successive failures of the attempts in this direction, which need not be detailed here, coming in conjunction with evidence from other sources, have awakened us to the realization that perhaps something more than the familiar proteins, fats, carbohydrates and inorganic nutrients are essential to the persistence of the life processes or the accomplishment of prolonged growth. The modern researches on the physiological significance of the secretions of the ductless or so-called endocrine glands and the growing evidence for the regulatory function of hormones or chemical stimulants distributed by the circulation have made it easier to believe that substances which are neither significant as sources of energy nor sufficiently abundant to construct new portions of protoplasm may nevertheless exercise a dominant effect upon nutrition. To one who has been brought up in the study of exact stoichiometric relations in science there is something almost unscientific and mystical in the discovery that mixtures of food stuffs which are selected from the chemist's supplies and fail to maintain animals can be made adequate by the addition of milk, for example, in quantities far too small to have significance as a source of energy. We are dealing here with what have been called food accessories or "vitamines."

Growth appears to be in some degree dependent upon the presence of chemical determinants of this order. For the present they must not be confused with other known essential nutrients, with suitable amino-acids, or inorganic salts, or appropriate carbohydrates. It must be recognized, at the outset, that unless the conditions are suitable for maintenance, growth which is normally superimposed upon it, cannot proceed. The value of food accessories of as yet unknown chemical nature has been made evident of late by feeding experiments with isolated food substances, where additions of small amounts of naturally occurring products have prevented nutritive decline or brought restoration. This is notably true of the "protein-free milk" devised by Osborne and Mendel for feeding rats. No artificial imitation of this natural mixture, which contains milk sugar, inorganic salts and very small quantities of unknown ingredients,

has been devised to replace it satisfactorily for considerable periods of growth. The success of the "natural" product seems to be dependent upon the presence of undiscovered "determinants" in minute traces. Evidence for the existence of such accessories is further furnished by the so-called deficiency diseases. In some cases heating seems sufficient to destroy some thermolabile determinant of maintenance. The development of scurvy from the use of heated foods is an illustration of this point.

It is not unlikely, in the light of the meager data now at hand, that there is more than one determinant or food accessory that promotes suitable maintenance. There is no justification whatever for including these unknown factors today in a common chemical group aside from the fact that they seem to be essential and to act in small amounts in ways not hitherto taken cognizance of. Some of them are unquestionably quite thermostabile, others are perhaps thermolabile. With the possible exception of Funk's beriberi "vitamine" they have hitherto eluded chemical identification. Perhaps they merely stimulate the appetite and thus induce an adequate food intake; though this explanation seems to be clearly contradicted by some of the existent reports. Perhaps they merely supply cell adjuvants like iodine or manganese or some organic compound, the need of which we have overlooked because it is quantitatively so small. In any event they represent an undetermined factor that must be reckoned with.

However, an adolescent animal may actually fail to grow upon a diet which serves well to maintain an adult individual of the same species. Grown rats have been kept in good health for many months on a ration consisting of protein, sugar, starch, "protein-free milk" and lard. Upon this diet the young of the same species grow for a limited period and then invariably decline. We have had the almost paradoxical experience that those animals which grow on the diet mentioned presently die, whereas those which do not experience growth are more likely to continue to live. This may be interpreted to indicate that in growth an essential substance presumably stored in some measure in the adolescent organism is used up, whereupon nutritive failure ensues; whereas in the absence of active growth a depletion of the material so necessary does not take place in the same degree. It has been shown that this cessation of growth can be stopped and growth resumed by the substitution of other naturally occurring fats for part of the lard of the ration. In butter-fat, egg-fat, cod liver-fat, and beef-fat,—and more specifically in the fractions of these containing the oil components liquid at ordinary temperatures—there exists a determination of growth in the sense in which this expression has been discussed above. It is apparently not a nitrogenous or phosphorized compound like the phosphatides which have been charged with growth-promoting effects, but experimentally its action is pronounced in rats. When other factors, such as suitable proteins or salts, are missing the chemical accessories yielded by the natural fats are obviously incapable by themselves of insuring growth.

How or why do these chemical determinants promote growth? The best that we can do today is to recite the facts. Perhaps they promote appetite and lead to gain of weight by inducing suitable food intake. It is not easy to reconcile such a hasty explanation with the marked differences between the fats

studied. Perhaps they merely represent chemical ingredients necessary at all times for the body cells, but needed in great abundance during increment in size and therefore not available in sufficient amounts in a diet adequate for mere maintenance with limited wear-and-tear or tissue loss. These problems are still with us.

New Law Provides "Dental Hygienists"

THE Governor of New York has just signed a bill which provides for the training, registration and licensing of dental hygienists. This marks the enactment into law of recommendations made some time ago to the Department of Health by one of its advisory committees. The committee's action was due to the great need for increased attention to the condition of the teeth of school children in New York, of whom, it is asserted, at least 90 per cent require dental treatment.

A subcommittee, appointed to investigate the matter, recommended the desirability of using dental hygienists and urged that a trial of the surface cleaning of children's teeth be made as soon as possible in one or more centers, preferably public schools, and that at the same time the children be given instruction in oral hygiene.

The new law provides that any dental dispensary or infirmary, legally incorporated and maintaining a proper standard and equipment, may establish for women students a course of study in oral hygiene. Such students shall present evidence of one year's attendance at high school, and after one year may be graduated as dental hygienists, upon complying with the preliminary requirements to examination. After satisfactorily passing the examination these students shall be registered as dental hygienists by the regents, under such rules as the regents may prescribe. Any licensed dentist, public institution, or school authorities may employ such dental hygienists, who may remove lime deposits, accretions, and stains from the exposed surface of the teeth, but shall not perform any other operation on the teeth or tissues of the mouth. The law follows the enactment of similar ones in Massachusetts and Connecticut, and it is expected that with the preventive steps made possible by the employment of such workers the condition of the teeth of the coming generation may be greatly improved.—*Health Bulletin,* New York City.

DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

JAMES DAVID MCCOY, D.D.S., EDITOR
LOS ANGELES, CALIF.

THE RADIOGRAM AS A FACTOR IN BETTER DENTAL SURGERY

BY EDGAR HAYDEN KEYS, D.D.S., ST. LOUIS, MO.

RADIOGRAPHY as applied to dentistry as a means of diagnosis and prognosis is assuming the role of a Nemesis, mercilessly exposing errors of commission and omission in all directions.

A most significant fact established by radiography is this—men who "admit" that they are superior operators, men who we "admit" are superior operators, the so-called mediocre part of the profession, and the charlatan, all are indicted by the radiograph.

Quite true, the skillful conscientious operator is remiss relatively to a lesser degree than his less skillful colleague, but even his percentage of failures emphasizes the imperative need of greater care, and something additional to our armamentarium, and that something is the x-ray.

In the past we have depended alone upon tactility in our root canal operations, and for this reason, we have condoned our many errors. Now that the radiograph affords us visual aid, can we excuse similar failures?

At an expense of much valuable time and energy we have been changing cotton dressings with a frequency that exhausted the patience of both operator and patient, whereas if a radiograph had been obtained at the initial visit, an extraction and alveolotomy or apicoectomy would probably have been clearly indicated.

It is now an accepted fact that our root and root canal surgery can only be correctly performed and checked by studying the findings of the radiograph.

Dr. Haskin, of New York, in the *Dental Cosmos,* October, 1916, says: "The radiograph has brought about the greatest advance in the practice of dentistry, and the time has arrived when no dental practitioner should be allowed to practice unless his office is well equipped for this work." With the first part of the Doctor's statement I think we cannot disagree; the latter part, however, is irrational, since we can enlist the services of the man who specializes in radiography, just as surgeons, the majority of whom do not make their own radiographs, enlist similar services.

So much attention is now being attracted to the possible connection between oral septic disturbances and infective processes in other parts of the body (metastatic infections), that it is not at all rare for a physician to refer patients to a radiographer, and in some instances, depend upon his own inter-

pretation of the radiogram and advice as to dental procedure. But it can be said in justice to medical men that quite a number always consult with and seek the co-operation of the dentist.

The question of how the patient is to secure the services of the radiographer is a serious one in many instances. It is a fact that every dentist has among his patients a certain number who are able to afford dental services only where a minimum fee is charged. The extra charge of a radiographer in such cases would entail an expense which they could not meet. However, in every large city there are hospitals that have departments of radiography where arrangements can be made for services at a minimum charge to people of small means. While it is easy to comprehend why a patient of decidedly limited income cannot afford the additional expense of a radiographer, it must be admitted here that it has been no easy matter to convince many people of ample means of the necessity of the co-operation of a radiographer, and until the public is more fully informed upon the importance of radiography in dental operations, this opposition will be encountered. Arrangements can be made between a dentist and some radiographer where a blanket fee will pay for about three serial films of a root canal operation. Three films will suffice for the average case.

The installation of equipment in your own office has disadvantages which are possibly outweighed by its advantages. The busy operator has little time that can be spared for radiography, and it would seem to the writer to be impractical to do this work unless it could be done by a trained assistant, the operator doing nothing more than placing the film. An additional fee of five to ten dollars included in the bill for dental services will cause no complaint upon the part of many people who object to going to radiographers on account of extra expense.

The writer would like to call the attention of the men who are contemplating the installation of machines to an excellent article from the pen of Geo. M. MacKee, M.D., New York, which appeared in the *Dental Cosmos,* April 1916. He emphasizes "the necessity of the dentist to acquire a requisite knowledge and experience before doing this work." Frequent cases of radiodermatitis have been observed by Dr. MacKee resulting from x-ray examinations of the teeth. The concluding paragraph impresses the reader that the whole article has been written for entirely unselfish reasons.

A few cases herein presented demonstrate to the writer's mind the radiogram to be an indispensable adjunct to most dental operations.

Case 1.—Case had been under treatment for months prior to coming to the writer's office. Diagnosis had been dento-alveolar abscess, the central incisor evidently being considered the sole cause, since the operator handling the case had confined his efforts to sealing the central incisor with some medicament, same being removed soon afterward on account of causing intense pain.

At initial visit a radiogram was obtained which tells the tale. It is clearly shown in the film (Fig. 1) that the apices of both the central and lateral incisors were involved in the same area of suppurative ostitis, the lateral incisor being the cause or point of infection, and the central incisor being the drain which

when treated and sealed would cause intense pain, necessitating the reopening of the tooth. This had been the procedure for about four months.

Treatment as indicated by the radiogram was the opening of the lateral incisor, the cleansing and disinfecting of the canal, insertion of a root canal filling; the same procedure was followed with the central incisor, after which apicoectomy of both teeth and curettement of the area were resorted to. The patient experienced no further trouble and a satisfactory result was obtained as is shown in the radiogram (Fig. 2) taken one year later.

Fig. 1.

Fig. 2.

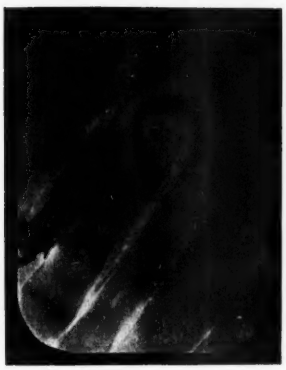


Fig. 3.

Fig. 4.

Case 2.—This case demonstrates a common error of both omission and commission: an error on the part of the writer in not having had the root radiographed at the initial visit, which had been filled some two or three years previous by a competent operator, an error upon his part which is clearly shown in the radiogram (Fig. 3). One year after porcelain crown of the writer's construction had been placed upon the root, trouble could be detected by palpation over apex. With the aid of a radiogram, apicoectomy and curettement were resorted to. A good result followed and the destruction of the crown was thus obviated. Fig. 4 shows condition of area two months after operation.

Case 3.—Case presented for construction of a new bridge to take the place of one seen on the radiogram. Upon examination, the mucosa over the edentulous area was found to be in a condition that would not indicate the presence of root fragments in the alveolus. Inquiry into circumstances as to how the

teeth were lost, and the answer that patient had fallen down the steps and the teeth were fractured, prompted the securing of a radiogram. Radiogram (Fig. 5) clearly shows presence of apical third of both the central roots which were removed prior to construction of the new bridge, thus obviating a possible cause of subsequent disturbances.

Case 4.—This case demonstrates the value of the radiogram as an aid in prognosis (Fig. 6), convincing both to operator and patient.

Case 5.—Patient suffering intense pain along side of face, and in frontal

Fig. 5.

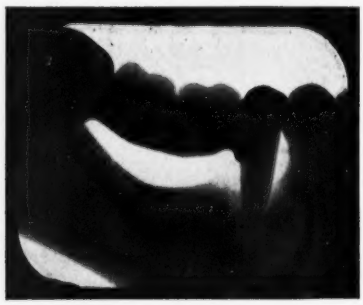


Fig. 6.

Fig. 7.

Fig. 8.

region. By elimination cuspid was suspected, and radiogram obtained. Focus of infection is clearly shown at apex and running slightly toward crown on mesial side. Apicoectomy and curettement were resorted to. Cessation of pain followed shortly after operation. Fig. 8 shows radiogram of the same case one month after operation.

Case 6.—Patient had no feeling in mucosa from lower bicuspid forward, or in lip to median line, indicating an involvement of the inferior dental nerve or its mental branch. Radiogram (Fig. 9) shows suppurative ostitis at apex of first bicuspid. Extraction of tooth was advised, a recovery of parts to their normal condition soon followed.

Case 7.—Patient experienced trouble about the apex of the first bicuspid, held in position by dental splint which had been applied to retain cuspid, bicuspid, and first molar. The radiogram (Fig. 10) shows a fracture near the

apex of the first bicuspid. This fragment was removed and the end of the remaining root smoothed. A satisfactory result was obtained.

Case 8.—This radiogram (Fig. 11) shows an ineffectual attempt to resect the apex of the mesial root of the lower first molar.

Fig. 9.

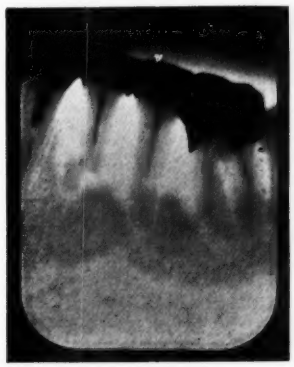


Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.

Case 9.—This is a demonstration of the usefulness of the radiogram in determining the size of roots of malformed teeth. The so-called peg-shaped tooth sometimes has a normally developed root and can be used for a dowell

and diaphragm crown restoration. The radiogram (Fig. 12) demands the application of a jacket crown.

Case 10.—Patient experienced full pain on side of face, no localized area, percussion or palpation revealed nothing. The faradic battery, to a certain extent, placed suspicion upon the left central incisor; this was confirmed by the radiogram (Fig. 13). Central was opened and treated, bringing about complete relief.

Case 11.—This is an instance where work of former operator was checked before completing a restoration of the upper cuspid by the writer. The film (Fig. 14) clearly indicates the need of a more perfect root canal filling.

Case 12.—Patient had all symptoms of streptococcus infection. All the teeth were radiographed, and molar with crown, as shown in Fig. 15, extracted. All symptoms disappeared within twenty-four hours.

The fact that none of the cases herein presented is unusual, but on the contrary, quite common in type, only emphasizes the importance of radiography in dental surgery.

Rœntgenographic Diagnosis of Dental Infection in Systemic Diseases

COMING from one of such eminence as Dr. Tousey, this little volume* is destined to stimulate considerable interest in the important subject which the title describes.

Recent developments in pathology render the clinical reports and observations made by its author more convincing than they could possibly have been a year or two ago, even though the clinical and radiographic evidence, backed up by Dr. Tousey's long experience, were sufficient to remove all doubts from his own mind as to his conclusions.

The opening paragraph of the author's introduction contains a paragraph worthy of emphasis, not only to a large number of physicians and dentists, but of great educational value to the public. It reads in part as follows:

"The widest publicity should be given to the fact that greatly varying and sometimes serious or fatal systemic diseases, and those affecting remote organs, are often due to infection connected with the teeth, or with the pneumatic sinuses."

In speaking of alveolar abscesses as sources of infection, the important fact is emphasized that these lesions sometimes develop insidiously and without local symptoms, which renders them more dangerous because they are not recognized, and therefore are not treated.

Therefore physicians having cases of systemic infection under observation and treatment in eliminating the teeth as a factor should not be satisfied with a dental examination which does not include a radiographic survey of the teeth and the enveloping structures.

The author's description of an alveolar abscess from an anatomical and pathological standpoint will no doubt seem exceedingly elementary to dentists,

---

*"Rœntgenographic Diagnosis of Dental Infection in Systemic Diseases," by Sinclair Tousey, A.M., M.D., New York City, Published by Paul B. Hoeber, New York City. Price, $1.50.

but no doubt it will be of value to many physicians who have heretofore never felt called upon to interest themselves in the anatomy and pathology of the teeth and correlated structures.

In discussing pyorrhea alveolaris as a source of systemic infection, and methods of procedure for its alleviation, the author states that all causes for this affliction "revealed by the x-ray" should be removed, such as "hard calculous scales from the root of the tooth," and "suitable chemical applications made to the pocket." This treatment by the dentist he considers indispensable, but suggests that in many cases such treatment should be supplemented by x-ray therapy and high frequency currents from ultra violet ray vacuum electrodes.

The warning is then given that "it certainly requires a great deal of experience and study in this particular field to make applications which shall be effective through the flesh and bone, and still have no undesirable effect upon the skin."

In emphasizing the important bearing of the teeth in systemic infections, Dr. Tousey states that in the important recent investigations of Hartzell, Henrici and Leonard, "in the medical wards they have studied especially arthritis, acute and chronic ulcer of the stomach, heart lesions, pernicious anemia, nephritis and nervous diseases of the neuralgic type. They find no important distinction between dental abscesses and pyorrhea as causative factors in these diseases. Either is frequently the sole cause and even in cases originating from tonsillar or other large foci of infection, the presence of pyorrhea or dental abscesses will keep up the disease after the large focus has been cured. All these cases are markedly improved by complete extirpation of the foci of infection."

The text of this recent contribution is profusely illustrated with seventy radiographs depicting the majority of the pathological and anomalous conditions of importance which are revealed by x-ray examination of the teeth and adjacent structures and which have a bearing upon systemic infection. The text is brief (72 pages) almost too brief in fact, but can be read with profit by anyone interested in the subject.

Among the author's conclusions, the last paragraph seems particularly worthy of repetition. "The x-ray is to be depended upon to show whether or not the source of trouble is connected with the teeth or the pneumatic sinuses, and if so, whether the trouble is due to malposition and unnatural pressure, or to infection. It would be a mistake to regard every case as due to the teeth, and proceed to sacrifice the latter without first making a radiograph which may acquit them of any complicity in the matter.

The Rœntgen Ray in Dental Practice

DR. A. H. MERRITT (*American Journal of Roentgenology*, 1916, iii, 264) discusses the use of the rœntgen ray in the following conditions: (1) periapical infections, (2) pyorrhea alveolaris, (3) missing and impacted teeth, (4) facial neuralgia.

1. Periapical infection. When a tooth loses its vitality it is only a question of time when it becomes infected. The acuteness or chronicity of the symptoms of this infection depend upon the number and virulence of the organisms engaged. If the infection lapses into the chronic state, the pain subsides and the patient is usually unconscious of its presence. A discharging sinus may be present or a blind abscess may surround the root of the tooth. Differentiation between these two conditions cannot be made by the rœntgen ray, nor is the severity of the infection disclosed by rœntgen examination. Every non-vital tooth should have the pulp removed, the root-canal sterilized and filled to the end in order to prevent trouble which is certain to come unless this is done. If abscess is already present in addition to this, the abscess should be opened through the alveolar process, curetted, packed with sterile gauze, and allowed to heal from the bottom. If the end of a root extends into the cavity, it should be amputated. Teeth treated in this manner are not a menace to health and should not be indiscriminately extracted. Where extraction is necessary it is advisable to first procure cultures for autogenous vaccines, as the secondary constitutional symptoms do not always clear up with the removal of the exciting cause.

2. Pyorrhea alveolaris. The amount of destruction of bone in this condition is not always correctly shown by rœntgen examination. If the necrosis occurs on the labial or lingual surfaces of the tooth, it will not be visible on the rœntgenogram. If it occurs on the lateral surfaces only the condition may appear to be worse than it really is.

3. In missing or impacted teeth the rœntgen ray is indispensable, not only to demonstrate the presence or absence, but also the relative position, of the teeth in question.

4. Facial neuralgia. If this trouble is caused by pulp nodules, or by enlargement of teeth roots (hypercementosis) the rœntgen ray is of great diagnostic value. The author lays great stress on the fact that it is seldom necessary to ray the entire mouth if proper inspection is made previously. Pyorrhea is easily identified while periapical infections always occur in non-vital teeth. The only thing then left to ray are malposed teeth, which are usually molars.

The International Journal of Orthodontia

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 801-807 Metropolitan Bldg., St. Louis, Mo.

Foreign Depots—*Great Britain*—Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates—Single Copies, 30 cents. To anywhere in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $3.00 per year in advance. Under foreign postage, $3.40. English price: 15/ per annum, 1/6 per number. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, postoffice or express money order, or registered letter, payable to the publishers, The C. V. Mosby Company.

Contributions—The editor will be pleased to consider the publication of original communications of merit on orthodontic and allied subjects, which must be contributed solely to this journal.

Opinions—Neither the editor nor the publisher hold themselves responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

Reprints—Since it is not desirable to hold type standing longer than absolutely necessary, all requests for reprints should be made at time of submitting manuscript for publication. Rate card will be sent with galley proof.

Communications—Contributed articles, illustrations, letters, books for review, and all other matter pertaining to the editorial department should be addressed to the Editor, Doctor Martin Dewey, 1016 East Armour Boulevard, Kansas City, Mo. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 801-807 Metropolitan Building, St. Louis, Mo.

Illustrations—Such halftones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

Advertisements—Objectionable advertisements will not be accepted for publication in this journal. Forms close first of month preceding date of issue. Advertising rates and sizes on application.

Change of Address—The publishers should be advised of change of subscriber's address about fifteen days before date of issue, with both new and old addresses given.

Nonreceipt of Copies—Complaints for nonreceipt of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply is apt to be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second-Class Matter

EDITORIALS

The Journal of the National Dental Association

SEVERAL years ago certain men of influence in the National Dental Association conceived the idea that the dental profession should have an independent journal. These men had many obstacles to overcome and objections were raised on every hand. Strange to say much opposition was encountered from men in the dental profession, and others who had interests in commercial houses did not desire the dental profession to have an independent dental journal.

The *Journal of the National Dental Association* has been published for a number of months and makes its appearance at intervals too far apart with the result that it has been found impossible to publish the majority of papers read before the National Association.

Difficulties have also been encountered due to the lack of funds, owing to the fact that the members of the National Dental Association have not sup-

ported the journal as they should. It was the desire of the promoters of the *Journal of the National Dental Association* to eventually have a journal which would bear the same relation to the dental profession that the *Journal of the American Medical Association* does to the medical profession. Before they can succeed, however, the dental profession must realize that members of the American Medical Association are paying dues of $5.00 a year for the support of their Association. Members of the dental profession must also remember that in order for this plan to succeed, they must contribute more to the support of their journal than they are now doing. However, at the present time, the large circulation and amount of advertising in the *Journal of the American Medical Association* makes this journal more than self-supporting. The question might be raised then—"Why would not the *Journal of the National Dental Association* be self-supporting?" The reason is that the dental literature for years has been dominated by commercial houses, and commercial houses have all the advertising mediums that they want. As long as the dental profession will support trade journals whereby the manufacturing concerns are able to get their advertisements before the profession through their own journals, and can do so at a much cheaper rate than they can by advertising in the *Journal of the National Dental Association,* trade houses will not support the *Journal of the National Dental Association.* As soon as the dental profession refuses to pay the advertising bills of the dental supply houses, as soon as the dental profession refuses to support the trade journals, just that soon will it be possible for the National Dental Association to have a journal and be able to sell advertising space at a financial advantage, and thereby make the journal self-supporting. Concerns that have their own advertising organs in which they can advertise free, and for which the dentists will pay $1.00 a year for the privilege of having the advertising matter sent to them, are certainly not going to support a national dental journal, which, by the way, has nothing to give except publicity, and which gives that publicity at so much per page. The only solution for the *Journal of the National Dental Association* is for the dental profession to get behind it and come to the realization that for a number of years they have been throttled and held down by trade journals, and just as soon as they do, and no sooner, will it be possible for the dental profession to assume a plane equal to that held by the medical profession.

The dental profession has long been asking for recognition from the medical profession, and nothing has mitigated so much against securing that recognition as the type of dental literature which has represented the profession for years. This was forced to the attention of the dental profession by a statement made by Dr. Hartzell from the platform at the last National Dental Association meeting while he was presenting the result of researches which he has been conducting under the direction of the National Dental Research Commission. He stated that the report in full would be published in the *Journal of Infectious Diseases* before it would appear in the *Journal of the National Dental Association* due to the fact that the scientific medical journals would not publish anything that appeared in the dental journals. This is very unfortunate indeed,

as it tends to show the respect or lack of respect which high class medical journals have for the dental literature and dental journals. The medical journals will recognize a few dental men, but will not recognize the dental literature as a whole, and the principal reason is because the dental profession has practically no journals of its own. The few that do exist have never received from the dental profession the support or recognition they merit, as can be proved by the lack of support which the *Journal of the Allied Dental Societies, The Nebraska State Dental Journal,* and the *Michigan State Dental Journal* have received, to say nothing of the *Journal of the National Dental Association.*

It is indeed very unfortunate that such reports as were given by Dr. Hartzell at Louisville must be published in a medical journal in order to secure recognition from the medical profession. Does this appear as though the dental journals of the past have served dentistry as they should? Does the lack of recognition which the medical journals give the dental journals prove the need of an independent scientific dental journal, not dominated and published by the dental supply house?

It is also very unfair to the dental profession to have research work which is supported by the National Research Commission, and incidentally by the dental profession, published in a medical journal before it is published in the official organ of the National Dental Association. It is a fact that at the present time the *Journal of the National Dental Association* is far behind with the publication of its articles, all because the dental profession has not supported the journal in a way to make possible the publication of the journal every month, or better, every week.

We think research work which the profession supports through the Research Commission should first be published in the *Journal of the National Dental Association,* and thereby make the medical journals recognize the fact that we have something in dentistry that is worth noticing. We do not believe that it is fair to everyone concerned to have the reports of the workers of the Research Commission published in medical journals because dentistry has no literature worthy of recognition by the medical journals. The answer to this problem is not the publication of the best that dentistry produces in medical journals, but the support of a dental journal which has the dignity to demand the respect of the medical profession. The *Journal of the National Dental Association* should be such a journal.

Preventive Orthodontia

IN some instances early treatment of malocclusion might be classified under another term, namely, preventive treatment. While there are other forms of prevention known and practiced among orthodontists, we do not believe they have ever been given the attention they deserve.

Prevention is the modern slogan of both the sciences of medicine and dentistry; it is the idea that is attracting the utmost amount of attention in science. The most heroic strides in the whole history of medicine have come about as a

result of the tremendous efforts in the prevention of disease. The members of the medical profession are doing yeoman service in preventive medicine, they are preventing the breeding of the mentally unfit, they have made typhoid fever preventive, and the limiting of cancer and the effecting of a cure is no remote possibility of the future. Dentistry has advanced hand in hand with medicine in her progress in the prevention of disease. We point to the oral hygiene propaganda which has called the attention of the world to the importance of oral conditions in relation to the general health, the preserving of the teeth and oral tissues by preventive prophylactic measures, and so on *ad infinitum,* but at the same time there has not been enough said about preventive malocclusion, and we feel that here is one place that merits attention in the orthodontic field.

We are aware that there are many cases of malocclusion which can be prevented from developing if they are recognized by some one interested in the child in their incipient stage, especially that type of irregularity resulting from vicious habits of the tongue and lip; then, too, those caused by hypertrophied lymphoid tissue and mouth-breathing or the too early extraction of deciduous teeth. In fact there are many malocclusions presented which have been developing over a period of years which can be prevented or at least remedied materially by the correction of habits at an earlier period and by advice as a result of intelligent diagnosis.

Dentists and medical men should be informed collectively and individually as to the etiology of malocclusions as we now know it, they should know the mechanism of occlusion and the tremendous influence exerted over the development of the bones of the face by the forces of occlusion and also the consequent results of perverted forces of occlusion.

The orthodontist who has a much better conception of the possibilities of the prevention of malocclusion unfortunately does not see his patients until the case is ready for corrective measures rather than preventive. The dentist and the medical man—also the pediatrician—are those who see these cases first; they see them at various periods during the development of the teeth and jaws, and consequently should be in a position to at least recognize the development of malocclusion in its very earliest stages if they are to render the best service to their patients and to society.

Like the history of all other preventive measures, the orthodontist can only hope to succeed through educational work, in his endeavor to extend the importance of this work; he should take great pains to teach the parents who come into his sphere, the importance of the early recognition of these conditions and the comparative ease of correction or prevention as compared to the advanced stage of malocclusion; he should point out to his confreres in the dental and medical professions, at each opportunity, that these conditions may sometimes be entirely avoided by proper recognition, and that at other times very simple and short corrective measures employed at the proper time may entirely thwart long tedious corrective procedure which would be necessary to follow a few years later.

The pediatrician above all others should know something of the subject of orthodontia particularly the progressive development of malocclusion, but un-

fortunately, at the present time, these practitioners have given little or no attention to the subject of malocclusion. While prevention of intestinal putrefaction and rickets have received no small amount of consideration, at the same time we believe a poor inefficient masticating apparatus incident to malocclused teeth to be one of the most effective causes of faulty metabolism.

The duty that confronts the orthodontist in this endeavor is a serious, but by no means an impossible one to discharge. Realizing that success in all human endeavors rests upon imagination, judgment and untiring energy, the orthodontist can undertake the work of prevention of malocclusion with a clear conception and almost positive assurance of getting results. Of the work to be done, there are three avenues open for propaganda work—the dentist, the pediatrician, and the orthodontist. Of these three the dentist is the one through whom the greatest good can be accomplished. Society has created a condition that is bound to keep recruiting the ranks of children with malocclusions—the bottle-fed baby, as an example. The dentist has an opportunity many times to do missionary work in preventing malocclusion before the child is born. Let him not hesitate to warn the expectant mother against the disastrous effects that sometimes occur as a result of raising the baby by artificial means. He should point out the effects of distal occlusions which may be started from this common practice.

The dentist in many instances is in a favorable position to be on the alert for the effects of an adenoid at the period when the child emerges from its infancy. He is in a position to point out the results, not only from an orthodontic standpoint but from every physical viewpoint, which may be expected if this condition is allowed to continue without attention. The dentist has known only one cause of malocclusion for so many years, namely, "adenoids," that it is *apropo* some other etiological factors should be privileged to also share this distinction. It has been so convenient and popular to say adenoids are responsible for so many disorders in children that suffice it to say that we should popularize at least one other etiological factor as the cause of malocclusion.

It is not uncommon to see the general health of an infant looked after while it is still *in utero*. Physicians know full well that the mother's surroundings, that her general nutrition, and her psychological condition during the period of pregnancy affects the health and well being of the new born. Why not put the infant after birth under the observation of the dentist, and why not arouse the dentist to the necessity of preventing malocclusion by proper care being given to the correct occlusion and relation of the teeth?

The pediatrician can play an important part in preventing malocclusion if the proper cooperation can be brought about between him and the orthodontist. He is now fully cognizant of the results upon developing arches of the constant use of the pacifier, and the constant tugging by an infant upon the nipple of a bottle, but he is not aware of the permanent deformities developing later in life which many times have such a simple start. A little missionary work on the part of the orthodontist among pediatricians and also among general practitioners of medicine, would in a short time greatly advance the cause of orthodontia as a profession.

Too many practitioners of medicine today associate the orthodontist with

the specialist in cosmetics because the orthodontist and his science have been so successfully featured from an idealistic standpoint. Many physicians believe that the correction of malocclusion is undertaken solely on account of a desire on the part of the parents of patients to bring about beautiful and symetrically arranged teeth. This is due primarily to the gulf that has existed so long between the medical man and the dentist and secondarily to the indifference of the orthodontist to widely extend orthodontic information among the practitioners of pediatrics and general medicine.

The orthodontist should keep constantly in mind that he who serves himself best serves others most. His efforts should be directed at all times to the education of parents who come under his influence as to how they can prevent teeth and oral deformities in their children. He should keep in mind that the dentist, the pediatrician, and the general practitioner should be constantly warned of the baneful effects upon childhood efficiency of malocclusions and at the same time that it is his duty to teach them subjects of this kind. He should be willing to devote a part of his time to this work and do it cheerfully. The physician should be made to realize that the early loss of deciduous teeth is a cause of malocclusion that can to a great extent be removed by proper prophylactic means. The laity have little or no conception of the value to the child of the first dentition. Little care is bestowed upon them because the parents have been taught for generations that, like the snake shedding his skin, the child would in time lose its deciduous teeth and these would be succeeded by permanent teeth. As a result of this, many children are made victims of a vicious malocclusion that could have been prevented had the proper care been given the deciduous teeth and their early loss prevented. No better work can the orthodontist do than to devote part of his day to educational work particularly in regard to the retaining of the deciduous teeth until nature has sounded their death knell. At least parents should be admonished of the possibilities of preventive malocclusion and their children periodically examined during the eruption of their teeth by a dentist who knows the landmarks of normal dentition and also the abnormal conditions.

In conclusion, the orthodontist should strive to prevent malocclusions in the very young by giving parents who come under his influence proper instructions with reference to those factors that are sure to produce deformities in growing children. He should endeavor by all means in his power to arouse among his confreres in the dental profession greater interest in preventive orthodontia, that they may advise the parents against influence and habits in the very young that will surely bring about malocclusion. He should extend his influence to the pediatrician and general practitioner and make them familiar with the results and possibilities of preventive orthodontia.

It should be more generally known that early correction of malocclusion is also preventive treatment; that in order to prevent malocclusion, treatment should be started as early as possible; that treatment should be complete by the time the permanent teeth are erupted with the exception of the third molar. Too much emphasis cannot be placed upon the importance of early observation of the mouth and teeth. One of the chief duties of dentists and orthodontists is to teach the gospel of prevention as well as that of a cure.

"The Rœntgenologist: Mechanic or Consultant."

IN the September issue of the American Journal of Rœntgenology, there appeared a very timely article under the authorship of Albert Soiland, M.D., of Los Angeles, in which the author called attention to the lamentable fact that rœntgenology is too often regarded by the medical practitioner in the light of a purely mechanical process, and as such is often referred to x-ray mechanics operating so-called x-ray laboratories.

In speaking of the situation, Dr. Soiland says:

"The extraordinary rapid strides of our science in all its phases have created many new conditions, some of which may well tax our capabilities to the utmost to properly meet and overcome.

"If our field of endeavor could be limited strictly to medical men, the elimination of many objectionable features would be easily accomplished, but the necessarily spectacular aspect of rœntgenology as a whole, and its appeal to laymen with more or less incomplete knowledge of electro-physics has enticed many to commercialize this science on a large scale.

"This has given birth to veritable x-ray picture galleries where x-ray plates are made of everything possible and impossible and at rates that range from a dollar up, and now our country is fairly overrun with men, neither medically nor scientifically qualified to compete with the trained medical rœntgenologist, yet supported by members of our own profession because they will grind out pictures at cut rates or at so much per dozen.

"Assuming that this statement is correct, there are three main reasons for this deplorable state of affairs. Either the clinician considers himself competent to interpret plates and applies to the lowest mechanical bidder to make same, or he places the *commercial radiographer* upon the same level with the *medical rœntgenologist*, or he has not yet fully realized the importance of medical rœntgenology nor associated with it the inseparable essentials of a well-balanced knowledge in all the subjects that go into the making of an efficient medical consultant.

"In our own city I personally know several colleagues who would rather patronize a lay radiographer than consult with one of his own kind.

"This is one problem for which I trust our society can suggest a remedy. It unquestionably behooves us all to conduct our work along lines that are compatible with the highest ideals in medicine and surgery, in order that we may merit the full confidence of our medical confreres.

"The present state laws of compensation for injured employees have brought into being a number of insurance companies that are making free use of the x-rays for examination purposes. While a few of these companies pay a fairly reasonable price for x-ray work, the majority go shopping for cheap x-ray men who will do job lot work at a ridiculously low figure. These companies, when they are made to realize that they are not paying for glassware at so much per dozen, but are seeking diagnoses and prognoses and competent medical advice based upon proper x-ray studies, may be induced to pay a fee consistent with the value of services rendered.

"Apropos of this subject there recently walked into my office a distinguished looking person whose card read, Dr. ————————, Rœntgenologist ..... Hospital, ... As this hospital was well known, I made haste to meet the gentleman and play the 'host gallant.' The doctor seemed well informed upon all matters rœntgenologic and spoke fluently of meetings attended and clinics visited in the large centers. After a hearty lunch at my most expensive club, I casually inquired of the doctor as to his alma mater and was

both surprised and chagrined to learn that he was not a medical man. He stated frankly that he had been an automobile salesman, had a fair knowledge of photography and through a political friend had secured his present position. It is perhaps needless to say that my interest in this man suddenly ceased and the incident is mentioned only to recall the painful fact that a man of this type is placed upon the same level as you and me, solely because he has learned to make mechanically good x-ray plates."

The same problem confronts the dental profession so far as rœntgenology is concerned. In all of our large cities, dental picture galleries have been established which for the main part are presided over by mechanics; and strange as it may seem, many apparently intelligent and sincere dentists refer their cases to such laboratories. Such action on the part of these dentists is certainly out of keeping with professional procedures. The making of radiographs is one thing, and the interpretation of these same radiographs is another thing. And the man who is not well grounded in anatomy, physiology and pathology, has no moral right to attempt to interpret any radiograph, even though he have ability along mechanical lines and is thoroughly familiar with the technic of radiography.

It is to be hoped that the time will come when legislation may be enacted which will put a stop to these medical and dental picture galleries, unless they can be presided over by men fully qualified and licensed in the particular field in which the radiographs are to be applied.

American Institute of Dental Teachers

THE next annual meeting of the American Institute of Dental Teachers will be held at Hotel Adelphi, Philadelphia, Pa., January 23, 24, 25, 1917.

A number of papers, reports and discussions relating especially to dental education will mark this meeting. All dental teachers are cordially invited to be present.

ABRAM HOFFMAN, Secretary.

529 Franklin Street, Buffalo, N. Y.